

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
3 October 2002 (03.10.2002)

PCT

(10) International Publication Number
WO 02/077776 A2

(51) International Patent Classification⁷: **G06F**
(21) International Application Number: PCT/US02/09530
(22) International Filing Date: 27 March 2002 (27.03.2002)
(25) Filing Language: English
(26) Publication Language: English
(30) Priority Data:
09/819,159 27 March 2001 (27.03.2001) US
(71) Applicant and
(72) Inventor: VANDE POL, Mark, E. [US/US]; 25150
Mountain Charlie Road, Los Gatos, CA 95033-8320 (US).
(74) Agent: BUSH, Kenneth, M.; Sirote & Permutt, P.C., P.O.
Box 55727, Birmingham, AL 35255-5727 (US).

CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK,
SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

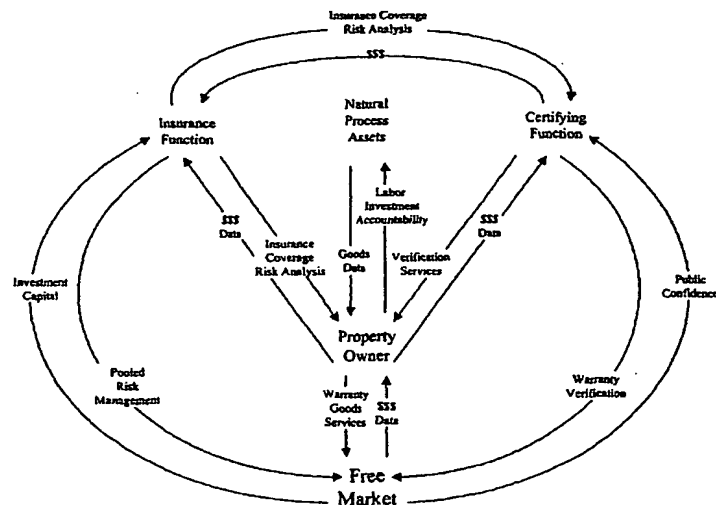
(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR,
GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR,
NE, SN, TD, TG).

Published:

— without international search report and to be republished
upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: FREE-MARKET ENVIRONMENTAL MANAGEMENT SYSTEM HAVING INSURED CERTIFICATION TO A
PROCESS STANDARD



(57) Abstract: Environmental regulation by government is structurally incapable of satisfying its mandate. The present invention is an alternative, free-market management system designed to deliver a superior product, at lower cost, with an insured guarantee, and without regulatory oversight by government. The system uses an insured, certified best-practice form of process certification that objectively accounts the financial value of ecosystem resources. The conduct of practice within the system accounts the price of assets at risk and characterizes their function by which to market them for their ability to offset the environmental impacts of industrial, commercial, and residential activities.

BEST AVAILABLE COPY

**FREE-MARKET ENVIRONMENTAL MANAGEMENT SYSTEM HAVING
INSURED CERTIFICATION TO A PROCESS STANDARD**

TECHNICAL FIELD

- 5 Environmental regulation by government is structurally incapable of satisfying its mandate. The present invention is an alternative, free-market environmental management system designed to deliver a superior product, at lower cost, with an insured guarantee, and without regulatory oversight by government.

BACKGROUND OF THE INVENTION

10 **Misallocation of Capital in the Production of Goods**

- Economic activity exists because goods are not uniformly distributed. Trade exists in order to reallocate goods to combine them into maximally useful composites. That usefulness is a subjective measure of a good, because needs are neither uniform nor constant. Total wealth is therefore only maximized when the integrated total of
15 individual satisfaction of needs is also maximized. It can never be achieved by planning or policy, because that would assume perfect knowledge of the best combination of all needs (explicit or implicit) of every individual. Thus total wealth cannot be maximized without individual freedom.

- Goods are purchased or sold based upon the degree to which their individual
20 utility exceeds the cost of purchase. When selecting a good to buy there is always competition between composite goods to satisfy the highest total of integrated needs. From the supply side, the considerations are the same, buy cheap and sell dear.

 The price of any good sold in the marketplace is comprised of hard costs and profit/loss. The composition of each is defined as shown in Table 1.

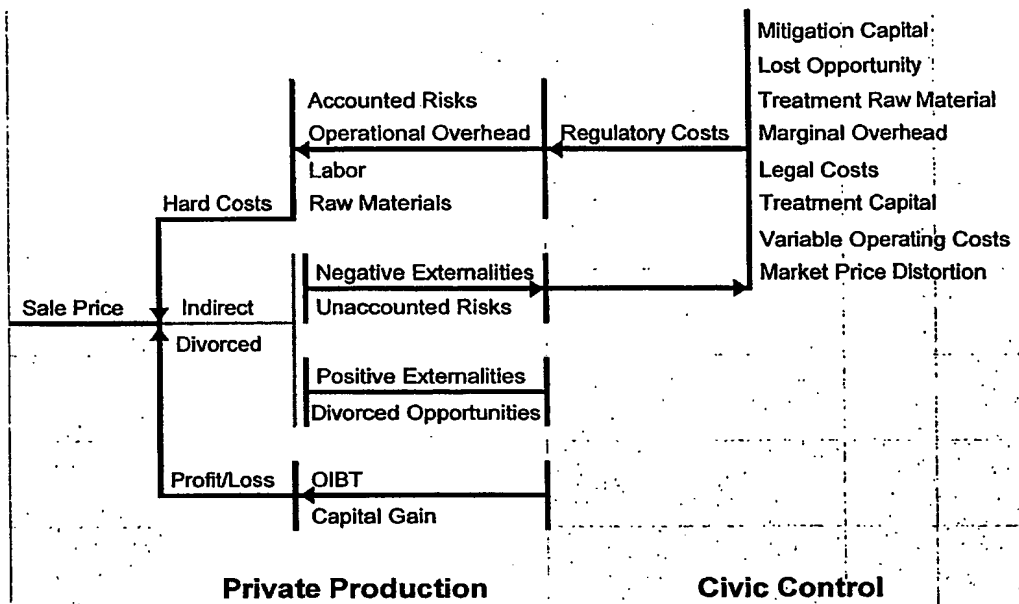


Table 1. Capturing Price Components of Business Operations

Table 1 defines indirect costs as not directly incorporated into the price of a good. Civic regulation is often justified to force transaction participants to incorporate unaccounted costs into the sale price. Civic regulation distorts resource use decisions when political and legal decisions fail to apportion these impacts objectively. Other popular goods are not marketable at all because there is now no way to charge customers for the product. Lacking a means to charge for the use of positive externalities anticipated revenues are divorced from the sale price of the good.

Similarly, some goods are not marketed at all because civic takings via eminent domain or regulation have acquired competing properties that suppress the price for the good, effectively acting as a predatory monopoly. These are divorced opportunities. Civic regulation does not address either positive externalities or divorced opportunities.

This invention addresses the capital allocation from two perspectives. First is the usual analysis of the cost of production of a product that has historically represented the highest composite profit. Second, it induces reconsideration of the choice of which products to market upon a more objective exposition of total costs and returns. Both consumers and producers can then make more rational economic decisions and better use of capital.

Externalities as a Single Sided View of Indirect Costs. Humans combine factor inputs to produce goods for economic exchange. The sum of factor inputs, called the economic factors of production, are either purchased (such as land, raw material, tools, intellectual property, or labor) or merely collected and used, not requiring a price of acquisition (air or rainwater). This discussion will refer to factor inputs that are collected without payment as zero-priced goods. Zero-priced goods include:

1. Goods sufficiently plentiful that a discrete pricing mechanism is too costly to consider.
2. Goods sufficiently difficult to contain that a pricing mechanism is mechanically impossible.
3. Goods without identified economic worth or use.
4. Goods with both positive and negative worth so closely balanced that their net market value does not justify a pricing mechanism.

Ownership of zero-priced goods is typically not defined or enforced by contract. Their economic value is considered equivalent to the cost of collection, containment, and preparation for use. That they are intrinsically valuable is not in dispute; a person certainly needs air to breathe, and a commercial fisherman needs an ocean but, in practice, we pay little to nothing for them. Few individuals attempt to own them because the cost of control exceeds the benefits of restricting use by private ownership. Among resource biologists and economists, environmentalists and politicians, these zero-priced goods have come to be known as **commons**.

Mobility or continuity in an economic factor complicates definition of property ownership. Unlike fixed property, retaining control of mobile or continuous goods (such as air or water) can only be effected via physical containment. Humans combine such factors with other chemicals, with which the biochemical processes of the human body produce tissues and perform work. The only time the air or water is actually controlled is when they were contained within the body.

Are they really contained in the body? Humans can't store the value of air or water any more than they can stop breathing or prevent sweat from evaporating. Humans must constantly exchange air and water with the surroundings to stay alive. How is it, then, that the air or water is "owned" when it is only, in fact, controlled?

Perhaps what is owned, is not the air or the water, but the operating series of biochemical processes that use air and water to perform work while they are contained within the body.

We can use this analogy of air and water contained in the body to consider ownership of those mobile and continuous goods contained on property. Just as the processes within the body combine mobile goods with other inputs to produce the body itself, the natural processes within property boundaries, transform inputs into the physical attributes of the property itself. Those processes that transform the state of mobile inputs into products for exchange are defined here as process assets.

Commons are a superset to zero-priced goods because they include resources that have economic value, but their prices are fixed at or near zero by social compact. Public access parks for example, though they are valuable, are used as if they were free because no price for use can be agreed upon among those with an equal claim and are therefore clearly commons.

The term "commons," then, will be reserved for those goods that, although they might have market value, are used as if the price of acquisition is zero.

Under conditions of decreasing supply or increasing demand, zero-priced goods can rise in scarcity to the point where individual claims are subject to competition. People then do work to define ownership as appropriate to their perception of unit value. A claimant will collect, unitize, measure, rent, mark, describe, and exchange property with increasing precision as its economic value increases. If a good does not have discrete physical boundaries, then the limits of ownership have to be defined in other ways, for example by the manner of containment or measurement. Once the boundaries to these claims are determined, ownership appertains to an economic person whether individual, partnership, corporate, or political. Goods then graduate from the status of commons to that of property. To establish the distinctions of owner-ship among competing persons, then requires definition of containment boundaries by contract.

When the amount of property under control exceeds physical containment limits, precise definition of property boundaries becomes more problematic, especially for a mobile or continuous good. Even physical boundaries on land are not static. River channels move, ridgelines are subject to erosion, roads are relocated, even continents drift. The claim to ownership of "fixed" property has thus often had much to do with the human perception of permanence within specific boundaries. In a

very real sense, all goods are mobile. In response to that mobility, humanly delineated boundaries now reflect artificial lines more often than physical landmarks reflecting the competitive need for precision and the cost of measurement or dispute.

5 This issue of mobility becomes particularly troublesome with continuous goods that move rapidly. Whether they are air, water, oil and gas, schools of fish, or migratory animals, as long as they are not contained it is difficult to define the boundaries of ownership. Some mobile goods move from place to place instantly, such as the emotive benefit derived from light reflected off a form that someone finds pleasing.

10 The economic value of these seemingly ephemeral goods is real. People know it. They pay to look at reflected light or to listen to vibrating air for entertainment. They notice the loss when a customary use is withdrawn. They get angry when a dam engulfs "their" favorite rafting river. They resist the introduction of a shopping mall onto a childhood playground even if they no longer live in the area. In each of these
15 cases, there is definite sense that one has lost something that one "owns" or upon which one has a claim whether or not they had ever paid for those goods.

These claims are not always fanciful. A person may have purchased property because of the speculative value of the use of mobile goods: the view, the quiet, air quality, or available groundwater. He or she has a definite sense of ownership of those
20 mobile commons, if not defined by contract, then by habitual use. Whether or not these valued commons were in the price of purchase, they are so defended should that use be threatened or withdrawn because they are necessary factor inputs for their customary use of property.

Commons are factor inputs for the production of all economic goods. Their
25 potential uses do not change unless a chemical or physical process alters their attributes. The potential uses of oxygen change when it bonds with hydrogen. The uses of water change when it evaporates, chemically dissociates, or inherits pollutants. The changes wrought by process assets upon factor inputs are the **transformation products** of those processes.

30 The economic costs or benefits associated with transformation products, not accounted in the price of goods when exchanged, are the **economic externalities** of the use of those processes. Claims against negative externalities in mobile commons focus upon those transformation products that limit the use of those goods after they exit property boundaries.

The notion of economic externality is an important economic concept in the rationale for environmental regulation. Assume the manufacture of a product produces pollutants that cross the plant boundary suspended in a mobile, zero-priced good, such as air or water. The cost of the pollution is not born by the producer of the good for sale, nor is it reflected in the purchase price to the consumer. The cost of the pollution is external to the buyer/seller transaction because it is borne by those affected by the pollution, who supposedly derive no benefit from production or sale of the product. Environmental regulations coerce the producer to incorporate the cost of pollution control into the product, thus supposedly forcing the consumer to evaluate its "true" price compared to other purchase options.

It is difficult for a single person to make a claim against a consequent loss of the use of commons when he or she can lay no claim of ownership. The complaints contend that those transformation products damage the use intended by those outside the property boundaries. Because the contested use is inside private boundaries, claimants against externalities enlist fellows to coerce surrender of control by the owner. The most powerful fellow available is government because it has a monopoly to enforce social contracts with police power. Unfortunately, any civic agent also has an individual competitive interest in controlling the use of property. This is the single reason that civic agency must never be able to express interest in controlling private property; else it accrues to itself control of all factors of production.

Civic regulation of the release of transformation products can effectively limit the use of private property to that of the majority preference. Assignment of that control by political or legal means is therefore to take private property in the interest of a democratic majority. Hence is the argument, that extension of a majority claim on the use of natural process assets transforms a natural resource into a **democratized commons**. Its use is restricted to the majority preference and little or no compensation is offered for legal restrictions preventing alternative economic uses.

To democratize a commons may seem like a good way to keep people from doing bad things, but it is a terribly destructive thing to do. It is to convince a democratic majority that taking public control of private property without just compensation is in the public interest. That immediately creates a single sided distortion of every investment decision.

The coercive means by which a majority exercises collective claims is the power to control social assets outside private boundaries. The owner must rely upon a

social contract to use public assets in order to produce salable transformation products. Public roads transport supplies and goods for sale. Recognition of the value the owner's money and bank account is a social resource upon which the owner has a contractual claim. The police power of the state enforces contracts and maintains respect for private property, as is necessary for commerce. Collective action to control access to any such factor is a threat to the property owner's economic survival and the source of the coercive power of a democratic majority; in other words, democracy is in fact a collectivist system.

To democratize a commons is also destructive to the contested asset because the maximum number of people extends their claims at a minimum unit price. Claims proliferate without limit because their cost is virtually zero. There is then no motive to maintain or improve the condition of the asset, or to invest in controlling the release of undesirable transformation products, because there is no prospect of a return on investment thereby. Private property is thus effectively destroyed because it has no economic use. Without a constitutional check on the exercise of democratic power to lay claims against negative externalities, such claims proliferate until private property eventually ceases to exist.

Unfortunately, government has every power to enact laws regarding discharge of transformation products because the concept of property as ONLY consisting of a social contract for use of bounded processes is poorly understood. Once an economic factor has been rendered into a democratized commons, claims against uses producing transformation products can then be effected through the courts by anyone and focus exclusively upon controlling negatively valued transformation products without consideration of the total integrated impact of the contested use. (Since when did anybody sue in order to pay for a positive externality?)

In the absence of a way to profit by a particular use of a good, that use will be forgone. Any profit forgone that would normally be derived from the sale or services associated with that good is called the lost opportunity cost of that use. Investment in that use is therefore forgone and the benefit that would have been derived thereby is lost as well. Thus in the absence of any means to market positive externalities, the single-sided nature of civic regulation distorts all economic decisions.

Financial Mechanics of Market Distortion by Political Regulation. The market price of any asset is competitively set with the expectation of a total economic return. When an asset has multiple uses its price is set by the total return on the composite of uses that can be managed simultaneously. One might graze land with marketable timber or operate a subterranean mine while farming. Some uses are exclusive of others; one can't simultaneously operate a farm and an open pit mine on the same land. In that case market price is ideally determined by the highest composite of uses.

When a particular use of property has no economic return, that use is no longer reflected in the market price. Such are the positive externalities of an existing use or opportunities divorced by regulatory restriction, price suppression or takings. In that case, there is no profit incentive to invest capital in the associated attributes.

Please consult Table 1. Note that without regulatory costs, that the cost of operations does not include externalities or unaccounted risk. That margin is returned to the property owner. Such costs are usually not fixed on a per unit basis. Much as using different processes to produce a product have different operating costs, yields, operating margins, and overhead, so to do different control processes that are used to manage externalities. In both cases of production process or controlling externalities, the law of declining marginal return dictates that one can expend sufficient investment in improving yields to render a zero total return.

To render a use of property valueless then only requires mandating the use of a sufficiently *inefficient* control process to consume the profit on operations. This motivates regulatory authorities to mandate only those processes that operate far beyond the point of diminishing marginal returns. It is not uncommon for example for an air quality authority in an urban area to mandate use of pollution control technology costing hundreds of thousands of dollars annually to consume less photochemically reactive pollutant than is produced by a single tree. Such a requirement simply closes the plant permanently.

Regulatory leverage is the power to control the use of property, and a temptation for political corruption to manipulate policy for profit purposes to either agencies themselves or their political sponsors. That leverage goes well beyond the mere cost of the control process. Each unit of property commands its own unique price range reflecting the total return on the composite of the relative suitability of each use. Removing a use by regulation not only eliminates the economic return on

that use; it reduces the capital value of the property to that of its most profitable alternative composite of uses. An example would be taking the timber value of a property by regulation and constraining it to scenic value, not only removing the return on the timber, but its most of its capital value as well. Finally, socializing property not only removes uses, it destroys what might otherwise be desirable alternatives, the lost opportunity cost of those uses. Nobody would go into the park business competing against a government monopolist who can take property for the price of inflicting regulations and charge virtually nothing to its customers for the park use. ALL potential park properties then end up as divorced opportunities and under-invested because of civic price fixing.

Regulatory asset value manipulation distorts nearly all economic decisions and thus constitutes an enormous misallocation of capital. Property is neither used for its highest composite of beneficial uses nor is the risk of existing uses objectively considered. Costs are incurred that are either inadequate to manage objective risks or are excessive for the purpose of manipulating asset value. Both the investments in improving the condition of the assets and the returns on their uses are reduced. When the return on assets of all property is deleteriously affected by the cost of regulation, when the assets are not used for their most beneficial use, total wealth of both humans and the environment is therefore destructively impacted as well.

The Incentive for Civic Takings. As concentrations of transformation products in process outputs approach zero, minute reductions in pollutants can greatly increase the cost of treatment. As the cost of compliance consumes a higher fraction of the sale price of the economic good, the return on the original use approaches zero. Once the return on assets goes negative, investment in improving technology to reduce production of negative externalities becomes negatively valued as well. Few would develop new control technology because few could pay for it. If there is no return on the use of the asset, that use of the property will be abandoned, as it has become a zero-priced good. Negative investment return destroys the market value of the use.

Both claimant and agent are thus motivated to focus upon those transformation products that are most difficult to control, because it is those properties that are most likely to convert the use of the asset to that which they prefer. The fight between landowners, regulators, and activists then degenerates into increasingly trivial

arguments regarding specifications, measurements, and enforcement that have increasingly large financial consequences for the owner. Remedial measures thus structurally diverge from an objective assessment of the total impact upon environmental health because that was never the claimants' primary objective.

5 Rarely does either acquiring interest consider the possible unintended consequences of their actions, among other reasons because they have little experience in actual operations and no accountability for the consequences. The legal process is thus alienated from its purpose to establish justice, just as the regulatory process is directed away from ecological health. There is little civic accountability for
10 maintaining a successful balance among competing interests, indeed, very likely the contrary is true. Problems are sources of civic claims by which to control the entire economy, a motivational structure antithetical to the very purpose of regulation.

As claims proliferate, the legislatures and courts are overwhelmed with cases that are technical and difficult to prove. They rely upon opinions from supposedly
15 disinterested experts regarding the impacts of transformation products. Neither legislators or courts have the power to enforce a judgement; that power lies exclusively with the executive branch of government. The demand for expediency seduces legislatures and the courts to default upon their Constitutional responsibility, to the only civic agency with relevant expertise and police power. Control of use and,
20 thus ownership of that use, is effectively transferred to the executive branch of government.

When the power to apportion the costs of externalities is controlled by a civic agent, the incentive is to use that power to take control of the asset.

Corruption is Inherent to Civic Regulation. As long as democratic control
25 of property is possible, all it takes to manipulate market value by democratic means is manipulate majority perceptions about the risk of harm associated with that target use. The few who can profit by taking competing resources out of production then have reason to sponsor the investment in political or legal action. They focus the first case against a weak target or obvious problem (which is why most such takings appear as
30 local actions).

Established precedent then extends the applicability of cited legislation and lowers the cost successive claims. Property owners gradually lose their ability to finance the cost of compliance or legal resistance. Absent a profitable use, the market

value of the target use approaches zero. After repeated exercise of external controls, purchase of the residual asset value concludes any remaining claim by an owner.

When a rival owner produces a competing or substitute good, the financial advantages of such tacit property acquisitions can be enormous. For example, if a developer funded public concerns about the negatively valued transformation products of farming to render the use of farmland non-economic and ripe for development, the land becomes less expensive to purchase.

This politically-sponsored dissolution of the Separation of Powers Principle, combines all three branches of government into one, that can derive power and funding by manufacturing claims on the use of property. The more externalities are regulated, the more power accrues to the agency to control the use of the producing asset to turn its use to corrupt purpose. When agency control is sufficient to alienate the interest of the agent from the democratic majority, the asset has then degenerated into a **socialized commons**.

The claims by which a commons is socialized are ironically often the same precedents as were used to extend the original democratic claim; i.e., by extending claims against the transformation products of the *democratic* use of the resource. With the legal precedents in place that were used to take control of the factors of production on individual property, the civic agent now has the legal tools to take control of ALL related private property. Control of the use of land is now in the hands of an agency that is alienated from accountability to the public claim for healthy ecosystem function. The agency instead serves the limited interests of the politically dominant, who use the power of government to gain *de facto* control of ALL factors of production.

A socialized commons is destructive to the regulated asset because the resource is under a controlling agent with no structural motive to prevent or eliminate problems. Quite the contrary, civic regulation not only doesn't work, it has every reason not to work. As problems worsen and resulting economic crises deepen, the power acceded to government agencies expands!

Commons are factor inputs to all economic goods. The power to socialize a commons by regulation is the power to transfer control of ALL factors of production to government. History teaches that this is not a good thing.

Behavioral Properties of Civic Regulation

During the early industrial revolution, civic authority ignored or deferred assigning accountability for economic externalities. Whether they were associated with manufacturing, food processing, agriculture, transportation, or resource extraction, government made all the final decisions about permits, leases, homesteading, or transportation subsidies. Government also chose to ignore the negative externalities of pollution, erosion, or automobile safety until they were serious problems.

The early manifestations of civic management systems took two forms. The first was dispensation from responsibility for economic externalities (of which the history of pollution management is an easily understandable example). The second form was direct subsidy, examples of which are: mining claims, irrigation and flood control projects, public roads, and agricultural price supports. Individuals and corporations have gained these dispensations and subsidies by political and legal means.

A century ago, continuing economic progress was the consensus democratic goal and the political resource management system made it happen. People wanted inexpensive goods and both prized the freedom to pursue their dreams and lacked the technical sophistication to understand the consequences of industrial externalities. Large corporations could easily afford to deflect legal challenges under civil liability laws. Only after a majority of the voters took interest in environmental degradation, pure food, or tested drugs did government force a change in policy.

Though priorities have changed, that transformation has employed the same political and legal means as originally used to abet the perpetrators. The intent to improve might seem to be genuine, but are the priorities truly any more sound? The policies of the last 150 years have much in common with the current demands of various activists:

They presupposed democratic control of the resource, they were based upon the political value systems of the day, they mandated single methodologies over widely diverse conditions, they depressed the profitability of privately held assets, they confiscated the use of resources for the exclusive benefit of politically dominant interests, they were enacted through lawsuits, and there were rapid changes, with enormous economic consequences, under a crisis mentality, and without accounting for unintended consequences.

The debate concerning whose preferred politically and legally coercive path must be used, fails to note that it is the political and legal process that is incapable of optimal, technical solutions. It is not a matter of whether we should allow people to do whatever they want. Political and legal processes are simply the wrong tools to best manage complex, dynamic, highly varied, overlapping, and competitive systems. The idea that government should hold a monopoly franchise to coerce politically preferred uses of private property, presupposes several errant assumptions:

Civic policy-makers are uniquely capable of technically appropriate economic choices in every instance, administrative government possessing coercive powers is an objectively disinterested arbiter, the unintended adverse consequences to the regulation itself will not outweigh the benefits, and there is no preferable alternative with which to motivate extension of the limits of land management technology.

A Civic Control System Minimizes Individual Options. Civic enforcement systems rely exclusively upon political and legal means to make decisions. A civic regulatory system is therefore, by nature, hierarchical and centralized, because enforcement must be uniform to be just under the law. Meanwhile, the purpose of the system is to make appropriate decisions in every unique individual case. It is the necessary use of uniform legal structure, inherent to civic regulatory systems, that renders them so inappropriate for managing numerous and competing claims under widely diverse circumstances.

Evaluating huge amounts of information and constructing universal rule systems to fit them is an enormous task. The cost of the process forces agencies to seek economies of scale. Although regulators understand that a "one size fits all" approach doesn't work, the system inevitably gravitates in that direction because of its cost.

The cost of the decision and the scale of the application leads to a need for proof justifying the decision. Interminable analysis leads those affected begging for an expeditious final decision for which supporting data may be insufficient. When the system finally breaks down and produces an arbitrary decision, the cry is that there was insufficient analysis or corruption. Lawsuits are a nearly inevitable result.

Because lawsuits are expensive, every effort is made to utilize the value of precedent, which increases the scope of the outcome. That enormous scale is what makes regulatory mistakes so dangerous and the solutions often individually

inappropriate.

The structural problem with the use of legal processes is that they are constrained by differentiating outcomes. Both adversarial legal processes and two-party political decisions proceed toward bipolar positions, a numerical minimum of oppositely directed options. The process drives the bases of argument to reflect differentiating properties and reduces the possibility of acknowledging either common ground or external options. The facts necessary to achieve a satisfactory synthetic solution may thus be omitted from the argument entirely. Neither are adversaries likely to opt for a solution that reflects the interests of third parties.

It is activists who personally benefit from the outcome enough to expend the energy toward their respective interests. Activists are averse to compromise or weighted analyses because their competitors within their group will defer to them only as long as the majority perceives that they are effective. Political and legal control systems are thus open invitations to manipulation by those with the most to gain. It is "deep ecologists", public agencies, corporate grant-makers, labor unions, and industry lobbyists who drive decisions, whether the relatively uninvolved like it or not.

The cost of conflict, the timetable of the docket, and the subordination of technical objectives to legal strategy limit the scope of scientific inquiry to the legally advantageous. The mechanics of civic decision-making thus inhibit either creative or objective study of alternative options. Negotiating positions therefore start from extremes and easily trade or concede only on less important aspects of the case.

Unfortunately, in nearly every regulatory field, whether environment, children's education, pharmaceuticals, or structural engineering, the asset under contention is not best managed by the outcome of a litigious fight. In many respects, the real barrier to the service of our charges is the adversarial assumption itself, because it assumes resolution through bipolar conflict. Optimal solutions cannot be subjected to the structural requirement of a binary outcome. Perhaps a motivational and competitive system among people striving to do their best might be somewhat less destructive and more apt to engender cooperative behavior.

A Civic Control System Distorts Scientific Objectivity. Knowing that they are unqualified to make technical decisions, or when confronted with divergent testimony, lawyers (and therefore politicians) seek supposedly disinterested "experts

in the field” to supply critical opinions. Unfortunately, the stakes in winning individual cases is corrupting the objectivity of technical inquiry.

Technical decisions are seldom completely deterministic, made instead among countervailing risks that must be weighed. Researching technical subjects usually requires expensive equipment and years of dedicated high-skill labor. Funding the collection of such expensive data introduces a fiduciary relationship between researchers and sponsors. Government, large corporations, and tax-exempt foundations now fund the vast bulk of research into life sciences. The source of money then has the propensity to skew data much the way opinion modifies perception. It may be bad for objectivity, but it has been an absolute bonanza for the “study-the-problem” business where universities, and government agencies, and charitable foundations have enormous financial advantages including cheaper high-skill labor.

University departments control the process that credentials expert testimony. Once a professor receives a grant to fund a study project, he or she can then recruit graduate students to do the required work for nearly free. The students need to specialize in order to get advanced degrees which reward analytical people for focused expertise. The professor distributing the grant can strongly influence the opinions of the students with grades and potential faculty appointments. Our “experts” thus end up knowing an immense amount about very little directed toward one side of a very narrow issue. If a problem has multidisciplinary requirements, there are consequently no experts who possess the intellect and experience necessary to weigh all practical and technical considerations to be found in any regulatory issue. That necessitates an interdisciplinary team composed of focused specialists at yet higher cost.

In addition to purely technical complexity, the scope of civic decisions is capable of producing enormous socioeconomic impacts. When countervailing technical factors are weighed by a scientist, not schooled in the social consequences of specific alternatives, there is potential for secondary technical impacts that are rightly part of even a purely technical decision. It is therefore increasingly likely to find an increasing fraction of social scientists in technical university departments who, by virtue of the subjective nature of their profession, are more likely to overlay subjective considerations to objective technical choices.

Personal interests of technical university experts also influence private consultants competing for contracts, through the peer-review process. In pure form,

peer review is a way to gain through, objective criticism. A problem with peer review arises when conclusions are presented that are sufficiently controversial to upset the gravy train for funding the specialty peerage. It becomes a career-threatening move to take controversial positions. It is simply safer to posture as protecting the public than
5 to risk being held accountable for saying that a particular enterprise is harmless, or perhaps, beneficial.

It is more common than one would think, that the political product of a study, its summary remarks, have little use other than to advance the particular agenda of the grantor. NGOs and government issue most grants involving regulatory issues. The
10 professors who manage these studies maintain their status by publication; thus, their expertise (and therefore their income) is directly related to their ability to raise grant funding. No grants, no credentials. No credentials, no expertise. No grants, no cheap grad student labor. No labor, no data. No data, no publications. No publications, no grants.

15 When civic and legal advocacy are the principal source of research funds, the propensity for scientists to serve sponsoring interests taints the conduct of all science. It is the civic power to control the use of property that brings these interests out of the woodwork and sets up the adversarial struggles in the first place. Once it starts, it only grows.

20 **Problems are Assets, Failure is Job Security.** An administrative bureaucracy is motivated to acquire and retain new administrative turf because problems justify a cash flow. Problems can thus be considered the assets of the regulatory enterprise. Problems are a source of income, a sense of purpose, or social power, so there is no motive to eliminate a need. Civic agencies are inherently stabile.

25 Problems in nature are neither static nor compliant to specification. Under dynamic conditions, static prescriptions end up being misapplied. With no checks on the system to assure that it is producing a product that meets the objective requirement to be beneficial, there is no mechanism by which it would voluntarily reorganize.

30 There are hundreds of thousands of people in the regulation industry. They collect paychecks and watch them disappear, just like everybody else. It would be daft to assume that they are, by virtue of either their individual intent or the purported purpose of their work, either evil or benevolent but there is no doubt that they will act in their own interest, just like anyone else. Public employees have the exposure to the

costs and benefits of targeted legislation with which to extend influence beyond their numbers. They also conduct either direct lobbying efforts of their own or fund NGOs to do it for them. The problem is that they have police power to effect disproportionate influence on any regulatory decision.

5 When administrative government functions as legislator, police, prosecutor, and judge, as funded by the penalties collected, when it acquires MORE power when the problem gets bigger, when that power extends to control the factors of all economic production, civic regulation grows irreversibly, without effective challenge.

 The inherent complexity and intensity of democratic struggles over intangible
10 assets, mobile commons, and economic externalities is the reason the decision-making process was delegated to appointed panels of experts in regulatory boards. Unfortunately, as the power of both activists and lobbyists has grown, as rules have propagated into thousand-page manuals, and the competing interests of numerous federal agencies and court cases pressures these panels of political appointees into
15 both fewer and conflicting options. The complexity of rulemaking entrenches a system of opposing lobbyists, each dependent upon continuing the system. The only experts in using the system, are then direct beneficiaries of regulatory complexity and continued contention.

 From the perspective of system-design, punishments for rule violations are
20 means to deal with system failures. Remedial rule changes are written with ulterior motives. Lawyers demand documentation by which to prove a case. Activists seek to magnify the administrative costs. Practitioners want rules that can be met without ambiguity. The system's attributes end up becoming more important to the transacting participants than is its purpose, which is why so many environmental regulations
25 backfire. It has its consequences.

Political Mechanics of Market Manipulation via Civic Regulation. Civic environmental management may have begun as a well intentioned but flawed idea, but the former is no longer entirely true. Once government gains control of the factors of production, it isn't long before industry leaders recognize the potential to convert
30 that power into a patronage system. When that power is capable of either handing them an oligopoly or destroying them, a rational person will learn to take advantage of it to survive. Those capable of exerting political influence are obviously tempted to

use civic power to increase the value of their assets or force competitors out of business.

The corporate winners often use their profits to start a tax-exempt foundation with which to fund political advocacy with the advantage of deniable culpability and without the annoyance of campaign contribution limits. They use the charitable
5 donations to lobby politicians, fund groups of activists in Non Governmental Organizations (NGO), and gather data supporting specific legal action as benefits cases sponsored through the NGO. The regulatory system thus ends up a triumvirate among NGOs, industry monopolists, and government regulators. The mechanics work
10 as follows:

There are economies of scale associated with regulatory compliance, as with any other cost of production. Capable compliance to rules becomes a barrier to entry and a means to target existing competitors. Rules can be tailored to the advantage to those possessing property with favored attributes. Competitors can be targeted by
15 similar means. Selective enforcement, through bribes, friendships, and political connections, is a problem as old as government itself. Regulatory constraint of competing goods can raise the capital value of existing production.

Political and legal advocacy can be very profitable. Private interests can easily impact commodity prices by sponsoring environmental advocating particular
20 regulations. It is easy to do. One need only successfully attribute harm to a majority interest in the use of a competing resource. These can be either direct competitors or suppliers of a substitute good. There are numerous tools available: tax policy, zoning law, the threat of eminent domain, and regulatory specifications as affects specific industries, locations, markets, or constituents.

There are numerous tools by which political forces implement political
25 influence of asset value. Examples include tax policy, land use and zoning law, the threat of eminent domain, and regulatory specifications as affects specific industries, locations, markets, or constituents. The purpose of this demonstration is to represent how the politically dominant manipulate environmental regulation to improve the
30 investment return on assets. Political and legal advocacy can be a very a good investment. Tax-based control of use occurs when an asset is taxed as property against what government has determined to be the "highest use" as opposed to that in which it is employed. If the return on assets is insufficient to fund the taxation that use has been effectively taken. Influence is exercised through a few badly paid local planners

or politicians. An example is that a developer might find a profit on lots purchased for speculative purposes by advocating adjacent open space through civic acquisition. Urban speculators can influence rents through consolidation of greenbelts around cities by zoning law, public open space district acquisition through eminent domain.

- 5 The cost of public purchase is suppressed through aggressive enforcement of environmental laws to specifying minute concentrations of pollutants or demanding specific measures for protection of habitat for endangered species. In this case, the beneficiary of the civic acquisition does not pay for that asset.

The public has abetted civic acquisition of resources by supporting laws
10 favoring NGOs that purportedly advocate for environmental protection in the courts. These actions attribute harm or potential harm to productive uses of private property, citing increasingly extended interpretations of existing environmental law. The legal representatives of these NGOs cycle through a revolving door as political appointees in civic regulatory agencies. Public acquisition for the purposes of manipulating the
15 value of resources that produce energy is now conducted on a grand scale. Nuclear power has been entirely withdrawn through NGO lawsuits. Species (such as salmon) have been maintained as endangered over the entire Pacific Northwest even when present in record numbers after a cyclical downturn. Billions of dollars worth of electricity was foregone with no demonstrated need and no objective benefit to the
20 fish. The nation's largest deposits of low sulfur coal were acquired through Presidential Executive Order. Gas reserves on the Western Slope of the Rockies and all Pacific Coast offshore oil and natural gas were similarly confiscated. Environmental NGO activist lawyers who once shut down electrical power plants, now sit on the Boards of Directors of major electrical producers who refused to
25 increase plant capacity in the face of increasing demand. The resulting energy crisis across the West has produced tens of billions of dollars in additional revenue to those fossil fuel companies remaining in production. Access to tens of millions of acres of public lands was denied, justified as forest protection. Meanwhile, public land managers ignored the dire warnings of forest professionals that such set asides would
30 induce disastrous fires and seven million acres of those forests burned in the year 2000 alone to confirm that prediction. Now sawmills in the Pacific Northwest buy logs from overseas.

One has to wonder how it is that such civic acquisition strategies, functionally equivalent to conspiracy, could operate on such a scale for so long. Individuals within

the system don't have to exercise conspiracy and collusion consciously for it to be such, particularly when governmental institutions are dominated by an entrenched group whose ideas and perceptions are immune to challenge and unconstrained by accountability. A functional conspiracy can be constructed merely out of acculturated personal preferences and social affiliations. These social groups are powerful people: academics, lawyers, planners, politicians, real estate agents, financiers, and developers, who all share a similar focus to implement their preferences by the means at their disposal. Bureaucrats consider the exercise of preferences to be an entitlement of the assumed expertise associated with a civic mandate. Except for a very few individuals, the present inventor's research did not discover evidence of evil intent or conscious conspiracy, although there was indication of obvious manipulation, preference, and willing obedience to questionable "requests."

Instead, there is a larger evil. It is the individual sense of entitlement, acculturated through the entire regulatory, activist, media, political, and legal community to project "what should be done" with private property in service to personal preference and without accountability for the results.

This is, by definition, what it is to covet. It is a self-deception, by which one entitles oneself to take the use of property without buying it first. It takes so long for the results of this kind of thinking to manifest, there is so much struggle involved, and there is so much self-reinforcing subjectivity within a powerful social group, that it really isn't hard to misattribute the results and fail to see the consequences of one's own invisible hand. This greater evil is inherent to socialized commons. Nobody would think that it is optimal that nature should be managed under a system that knows only coercion. It isn't logical to expect expertise from inexperienced urban youth, blinded by fashionable ideology. One shouldn't expect solutions from bureaucrats with a structural motive to perpetuate problems, nor should ecosystem management algorithms be designed by politicians and lawyers.

To accuse capitalism of environmental damage because of "greed" on the part of individuals belies the fact that the system we are using has been government resource control, all along. It has always served whomever happened to be in power, whether by political payoff or by majority support. Lawyers, foundations, academic grant hustlers, and NGO grandstanders, many of them ignorant of resource management practice, are now mucking about with the environment just as destructively as any timber baron or strip miner ever has, and on a scale of which they

could never dream.

The sheer scale and intensity of the catastrophic fires, the unabated spread of weeds, and the misery that has befallen so many "reintroduced" predators, have all resulted from misguided efforts to force nature to comply with human dreams, coupled with the civic resources capable of making huge mistakes; all-too-commonly followed with finger pointing, backtracking, and denial, with the ubiquitous excuse of "insufficient funding." "Mother Nature" is being reduced to a welfare case. It is not fixable by "new leadership," more money, or higher standards of professionalism. A regulatory system inherently does not work because its motivational structure can not be designed according to natural law. Nature is dynamic, adaptive, competitive, and uses distributed risk to integrate individual interests. Free Markets have all of those attributes along with the prospective intelligence and creativity of human beings.

The exercise of political power to control the use of private property by civic regulation is just too much temptation to trust its players to manage resources out of altruism. It puts the politically dominant in control of all economic factors of production. That leverage is too great to trust our future and our freedom. Regulatory government is a tremendously crude system. Compare the number of variables it can handle, the speed of decision-making, and its operating overhead costs against the sophistication and flexibility of a free market. Compare the predictive capacity, adaptive response time, and efficiency of the Chicago Board of Trade, against a County Planning Department. Compare the complexity of producing a permit review to the manufacture of an automobile or computer. There is no comparison. The question really is: How would a free market, motivated to reduce or avoid costs, choose to incorporate the cost of externalities into the conduct of operations? Let's take a look at some clues from existing private regulatory systems.

Existing Private Regulation: Certification Systems as Partial Solutions.

There are several existing certification systems that demonstrate the present invention's applicability to environmental law. Each has deficient properties. The first regards manufacture of electrical appliances, and the second, forest certification.

Insured Certification in Manufactured Goods. Certification companies have no incentive to corrupt their standards for the benefit of any particular industrial concern. The reason is that they have earned their public confidence in diversified

markets. The loss of confidence in any one of them would spell total loss for all. In this system, a second level check on their behavior is the financial cost of the reinsurance they carry, based upon their record of misjudgment.

Consider the example of electrical appliances. This industry recognized, long ago, that electrical appliances carry potentially fatal hazards. The products were subject to misuse and damage. Production standards were variable. In order for public confidence to be maintained and to protect manufacturers from either government mandated production standards or capricious lawsuits, Underwriters' Laboratories (UL) was constituted. UL manages tens of thousands of products, without need for civic oversight. Considering that few people worry about the safety of their appliances, can you imagine having to go to Congress or a bureaucracy for every new type of wire insulation? That is what we are doing with the environment. Civic compliance destroys innovation because they have little structural motive to nurture it.

Existing Environmental Certification as Applies to Forestry. The following is a comparative discussion of three existing forestry certification systems.

Type 1: Voluntary Guidelines of Industry Associations. The largest forest certification program in the world is the Sustainable Forestry Initiative (SFISM) sponsored by the American Forest & Paper Association (AF&PA). This organization is comprised of large, industrial producers of pulp and lumber. The purpose is obvious: remove bad actors, retain competitive productivity, and deflect political and legal pressure from environmental activist organizations. SFI certification proposes its own standards and requests self-certification of its membership. No matter what the level of integrity of its membership, the system has a discernable potential for conflict of interest in verification because there is no independent auditing function. It is easy to bias specifications to favor the attributes of property held by specific owners.

A structure like this will lose a political battle under accusations by environmental NGOs looking to support their organizations by fees for verification "services." "Independent verification" by activist organizations is subject to its own inferred conflict of interest on the part of the environmental NGOs themselves. The NGOs' claim of sole legitimate authority for accreditation of third party certification is akin to the acquisition of market share by political extortion.

Setting aside NGO business ethics, there are legitimate questions about their technical competency for this kind of oversight and no reason for them to extend their

standard of competence. Given that the paper industry is a competitive business, this industry rightly fears the kind of political leverage that the NGOs represent as well as the potential violation of confidentiality regarding intellectual property. Such process distinctions can be critical during consideration of a specific technology, for example, a type of genetically modified tree or specialized machinery that might have taken years (and millions of dollars) to develop.

There will probably be no way to avoid third party verification. What remains is who should do it, how it should be verified, and who is financially responsible? The SFI system design does not accomplish these goals.

10 Type 2: Third Party Chain-of-Custody Systems Audited to Performance Specification by an Accredited Non-Governmental Organization (NGO). Third party audit systems are intuitively appealing because they reduce conflicts of interest. The key assumption to a successful implementation is manifest disinterest of auditors, professional expertise, equitable treatment, and financial accountability. 15 Unfortunately, the execution of the prototypes in the timber industry has lacks all these attributes, exposing deficiencies that necessitated development of the current invention.

Type 2 certification uses independent audit to specification or a performance standard. So far, the way it has been implemented has manifested many (but not all) 20 of the structural problems to be detailed. There are inherent structural deficiencies associated with using conformance specification of environmental certification systems.

There are two corporations now operating this type of forest certification program: Scientific Certification Systems Inc. and the Institute for Sustainable Forestry (more commonly known as the Rainforest Alliance). Both are accredited by 25 the Forest Stewardship Council (FSC). There are several more companies with current applications for accreditation to the FSC, most notably the Certified Forest Products Council (CFPC). If the AF&PA surrenders to activist pressure and seeks FSC accreditation, it would make the FSC the only certification program of this type in 30 every town, otherwise known as a global forest certification monopoly.

The FSC is a NGO incorporated under Mexican law, based in Oaxaca. It derives its accreditation from the likes of the International Union for the Conservation of Nature and Natural Resources and World Wildlife Fund through their member

organizations: Greenpeace, the Sierra Club, Friends of the Earth, and the Environmental Defense Fund (to name but a few). The FSC carries a lot more weight behind it than that: the Ford Foundation, the Rockefeller Foundation (Standard Oil), the Pew Charitable Trusts (Sun Oil Company), and Prince Bernhard (Shell Oil),
5 among others.

The FSC program is organized as a chain-of-custody system. It regulates forest practices by control of the customer base through "green" labeling. The idea is that, if the supplier adheres to FSC specifications and operational requirements, and subscribes to independent verification services provided by FSC accredited auditors,
10 they can use the FSC logo on a "green" label. The label allows the supplier to claim the endorsement by the FSC for their standards of practice, certified by the accredited auditor. All that remains is to track the product through the entire supply chain so that an impostor cannot sell goods as certified. There is supposedly a reason for impostors to want to do this. FSC market research indicates that 80% of customers say that they
15 will pay higher prices for products with green labels. That claim is suspect when it comes to construction materials.

Early applications of the labeling and chain-of-custody principles were applied to the case of "dolphin free" tuna or vegetables marketed as having no detectable pesticide residues. These products involve little integration into higher order levels of
20 complexity: the fish stays as fish and the vegetables don't change composition unless they are integrated into prepared foods. There are a limited number of things a fisherman has to do to comply and, other than the difficulty of auditing a boat at sea unobserved, it is pretty easy to determine if they are killing dolphins or not. Once the fish is off the boat, it is canned, labeled, and boxed immediately. It is also relatively
25 easy to audit the vegetables by testing samples taken from a store. It gets a bit more complex with timber products.

The essential problem with chain-of-custody systems, is that wood is a raw material. Wood is integrated into a huge range of products: structural lumber, fencing, pressboard, sawdust for pulp, chemical feed-stocks for plastics, moldings, all in
30 various grades and various lengths. The boards do not come off the log in order and some logs can't make many of the products at all. The boards do not occur in proportions that match demand. The mill must store a few pieces and keep them separate from non-certified logs while they run enough logs to accumulate a saleable unit, particularly of larger sizes or higher grades. It is an expensive inventory

problem.

Chain-of-custody is a supply management problem unless the mill owns sufficient certified forest acreage. If a smaller mill operator sells only certified goods, then they must buy logs only from certified forests. These are often further away, with higher trucking costs and uncertain deliveries. If they must mix log sources because either the supply of certified logs or demand for certified wood is insufficient to keep them busy, inventory management becomes extremely complex. If the composition of demand changes, one is left with either an expensive product deteriorating while in inventory or selling it to someone who will not pay extra for green labeling. The double inventory factor also greatly increases the complications of optimizing the utilization of materials by highest value grade, which decreases the profitability of the lumber. It also falls afoul of the ecological principle of best use of resources. It either means that the mill operator must have sufficiently high production volume that these inventory accumulations are not a problem, or market only certified products.

The price consumers have demonstrated willingness to pay for the benefit of certified lumber has been insufficient to offset the inefficiencies induced by the certification process. The landowner just doesn't get very much for the initial investment, much less the additional operating costs.

When one contemplates how certified-content, in-house construction might be verified, or would serve as a market advantage, the benefits of green labeling start to appear increasingly suspect. Once someone sells lumber into a house, does the owner know if it is all certified wood inside the walls? Not all the lumber produced ends up in the final product. Poured concrete foundations use a great deal of wood that ends up unusable or discarded. How would anyone track whether certified wood was used there, by poking through dumpsters?

Worse, if contracts are negotiated among suppliers and retailers for exclusive use of green labeled products there are serious concerns about collusion and restraint of trade. The entire "chain-of-custody" method may well have worked for cans of tuna, from which people can choose among brands on a supermarket shelf, or for vegetables, because the consumer can choose a different store. It is not so applicable to lumber, some of which may be in the frame of a house and not in the sub-flooring because such products may not be available. People are much less likely to distinguish among houses by green labels than among cans of tuna or stores selling vegetables. There are too many ancillary considerations in the purchase of a home that have much

more bearing on buying decisions, such as location. Customers usually won't pay a higher price for a house built of certified wood to offset the higher product cost or the difficulty of finding an alternative supplier. When the product has a sole source, such as a book, the decision of whether the book is made of certified paper becomes
5 ridiculous. One can't pick an alternative source of a book and still buy the product.

When asked about these problems, the FSC answer is that chain-of-custody is not a requirement of FSC certification. It is, however, required if the mill wants to put the green label on the wood to get that higher price "promised" by FSC market research. Without the label and the chain-of-custody, the mill can't get the higher
10 price unless there is a customer so rich that they don't care what the price is. If the mill gets the higher price, a lot of good material is wasted getting the specialized product the customer wants at net adverse environmental impact. If the mill can't get the higher average price what benefit does Type 2 Certification supply to customers?

There are more problems with FSC certified systems than chain-of-custody.
15 First, the FSC not only claims it can get the mill a higher price for its product, it claims that it is a legitimate judge of expertise to certify production practices for all forests worldwide. It is demonstrable that legitimate disagreement and ignorance still exist about the best way to manage various single types of forest even where we have been managing those forests carefully for a long time. Thus the FSC claim of
20 expertise, its reason for existence, can't be validated.

Second, the FSC subordinates its ecological management to political and social goals. It starts out with the "accreditation" of the FSC itself by its requirement for adherence to all UN treaties, ratified or not: "In signatory countries, the provisions of all binding international agreements such as CITES (Convention on International
25 Trade in Endangered Species of Wild Fauna and Flora), ILO Conventions (International Labor Organisation), ITTA (International Tropical Timber Agreement), and Convention on Biological Diversity, shall be respected." This hierarchy immediately politicizes and socializes the claim of accreditation on the scientific conclusions of the subject organization. For example: There are unspecified
30 commitments to "maintain community well being." Who determines what that means? There are requirements to "conserve economic resources." What those are is subject to economic variation and subjectively-determined as well. There are requirements to "maintain biological diversity" even though some forests naturally go through periods of near monoculture. The UN guarantees the "rights of indigenous

peoples,” and those guarantees are written into the bylaws of the FSC. What happens if a tribe of “Native Americans” makes a property claim against the land? Are the owners required to surrender it?

Given that the FSC is a supporter of the Convention on Biological Diversity, and that the Global Biodiversity Assessment specifically endorses the Wildlands Project, does that mean that the use of the land must eventually conform to the whims of the Seville Strategy of the IUCN and, therefore, the Wildlands Project? Does this mean that a forest as certified under the FSC, no matter how well managed for production, must eventually be surrendered to a status of “no entry”? It is, at least, a tacit violation of U.S. law, to agree to contractually require adherence to the terms of rejected treaties.

Third, there is no regulatory benefit to FSC membership because it subordinates its verification to all local laws. There is no added value if the laws are in error or in conflict with those rejected treaties; indeed it is an overlay of additional bureaucracy that puts the landowner in a position of serving multiple masters with differing opinions.

Fourth, there is no consideration of offsetting funds or mechanisms for risk management or means to minimize the cost associated with adherence to FSC principles. Nor is the certifying body accountable to fix the problem if they are wrong. If the practitioner fails or makes a mistake, there is no backup.

Fifth, there is no motive for the landowner or practitioner to extend the state of the art for their specific situation. There is, instead, the assumption that the FSC is the seat of knowledge, standing in judgment of the certificate holder for their specific unique circumstances. How is that structurally superior to local regulatory control?

Sixth, the FSC is about forests. Who decides the value of other types of habitat affected by the forest, relative to the local circumstances? What if the forests have grown over meadows. Do they care about those? There is no structural means to identify the relative contribution of resources specific to an individual property and foster the best superposition of countervailing interests in that location.

Seventh, because this type of certification is audited to performance criteria, the inspections are subject to the interpretations of the inspector. The interpretation differs from audit to audit, based upon the interests and goals of individual inspector. This is a recipe for graft and extortion, not to mention a headache for the forest landowner.

Finally (and in the judgment of the author, the most egregious failing), once a critical mass of forests are certified by the FSC, what is to keep the organization from changing what constitutes sustainability and/or acceptable performance specifications? These organizations are, after all, beholden to their benefactors. The rules of the group are likely to be defined by an internal structure of bipolar stability. What if someone in the organization dreams up a requirement for "cruelty free" lumber? If there is an internal coup d'état in one of the governing NGOs, then there is a shift in control of the entire organization. What is to keep the social welfare crowd from hijacking the forest from the owner and the environmentalists to make houses for the poor? What if the UN decides that these specifications are to be subject to an overriding global social need? Isn't this a recipe for disaster?

Thus, the FSC operates very much like a protection racket without the protection. It has but one advantage to the landowner: Because it is the only certification system blessed by environmental NGOs, the landowners and timber operators might be left alone to take care of their forests if they seek the appropriate blessing. These "protection benefits" have been illusory. When there has been dispute with local government over what constituted best management practice, the accredited auditors have historically been of no help, whatsoever. Reports from those interviewed suggest that they fall back upon the "adhere to local laws" aspect of their bylaws and defer to the local authority. Thus, the most important reason that the timberland owners and foresters have for certification ends up producing no real benefit.

The FSC system, however well meaning it might be, is still unaccountable political control of a resource on multiple levels subject to multiple authorities. It is yet another way to lay increasing external claims upon the wealth of the land.

Type 3: Process-Based Systems Audited by Standards Organizations. Type 3 certification has favorable environmental properties, in that it starts as a process certification and not a performance standard or conformance certification. There are two organizations offering such certification products, the International Standards Organization (ISO) and Canadian Standards Administration (CSA) (whose product is traceable to the ISO 14000 environmental process specification). The ISO is accredited by UNESCO (which leads us back to the UN) but so far has had a fair track record for scientific independence, given its technical origins and composition.

Neither of these products enjoys support by environmental NGOs. ISO 14000 is currently in the process of developing a chain-of-custody system, which would be equivalent to restraint of trade by a bureaucracy accountable to no one under treaty law.

5 “Performance” certification systems are designed to prove that the product is adequate. They more seldom address the distinctions of how the processes are designed and optimized to produce that product. They do more for verification to the specification than the improvement of the process design. They do less to integrate quality systems into the mechanics of continuous process improvements than to
10 organize the enterprise around paperwork. More manufacturers adhere to the ISO 9002 manufacturing quality system, which involves verification of process conformance to specification, than the ISO 9001 document that includes a controlled process for design validation. Most manufactured products derive their production and quality problems out of design related problems. So it is with process designs as
15 well.

 The purpose, for any certification system design, is to imbue confidence in its ability to verify the trustworthiness and competence of those under audit. What performance specifications do provide is the sense of emotional security attendant to a deterministic outcome. They make people feel good without necessarily knowing why
20 and are thus an easier political sell. Validated compliance to specification does not mean that something will work (much less be optimal), only that the practitioner can prove compliance. That’s how the US military gave us \$200 hammers. It took \$200 to prove compliance to specification. It did not make for better hammers.

 Nobody knows what is “best” in environmental management. “Best” should
25 be a verified means by which these things are learned, tested, and subjected to independent review upon consideration of the conditions specific to the location in question, not an outcome. It should always remain an elusive target to be pursued with vigor. Our understanding of ecosystems is too ephemeral and the circumstances too dynamic and varied for conformance goals to work among living ecosystems.

30 To attempt to write a specification that describes the form of an outcome of an environmental product is fraught with the same complications that led to the California Forest Practice Rules comprising over 1,000 pages. Performance specification (rule-based) systems may feel good to customers, but they are not dynamic, adaptive, diverse, competitive, or capable of differentiation – quite the

contrary. Worse, how is the design of the specification itself to be verified?

It is here that the opportunity and superiority of process certification systems have their greatest opportunity. It is how you do, what you do with stuff, that changes its state. One can verify that one did what one proposed to do and then measure how it worked. It is here that the bulk of research must be directed, not only to come up with good ideas, but to devise systems by which a practitioner identifies and tests the efficacy of the way process improvements are developed and tested. Specification systems fail because deviation is not allowed.

That is what is not being done with either the ISO or CSA products. These certification systems are designed to prove that the systems the operator uses will deliver a specified output, usually determined by the local authorities! They thus end up functioning as a conformation specification. That they are a form of process validation is an improvement.

Unfortunately, Type 3 Certification not only relies upon chain-of-custody as a benefit; it does little to systemically push the limits of best practice. It offers no regulatory dispensation. It does nothing to financially manage risk and offers no mechanism for weighting options, nor do the services operating thereunder have a financial stake in successful experiments. Without these, the environmental and financial benefits to be discussed in this and proceeding chapters cannot be realized. We can do better.

The Need for an Improved System.

Ecosystems are diverse, dynamic, and change irreversibly. They are subject to random events of enormous scope. They operate in an interdependently competitive manner. Species undergo random mutation, are capable of near monoculture, and are subject to ruthless extinction. Nature is an entirely objective judge of fitness, not to be underestimated.

The civic environmental control system enjoys a monopoly assumed to be natural. The extent of its powers is unchecked, unaccountable, irreversibly acquisitive, maladaptive, and indissoluble. Its motivational structure is to perpetuate, extend, and accrue problems rather than to complete a job and cease operation. The concentration of civic power inherently attracts corruption, incompetence, and manipulative greed. It has been thus since the dawn of civilization. It is why the Constitution instituted

limited government to secure unalienable rights to citizens.

Plants and animals compete for scarce resources in a manner similar to laws of supply, demand, and indifference, much as people do. Business now applies many of these economic laws by quantitative computer models in its research toward
5 predicting commodity market behavior. Manufacturers must have some idea what the demand for a product might be or they may size capacity incorrectly, either losing early market share with high margins, or wasting capital invested in a "turkey." Investors must have an idea how to weigh a prospective risk associated with an action. They offset that risk by hiring insurers to understand how to quantify and
10 efficiently manage the capital to mitigate an error in judgment. Much of that investment in analytical tools is thus available and applicable toward the management of risk in environmental systems.

Human intelligence is not only adaptive and competitive; it is creatively prospective. The chaos of speculation among independent interests can provide the
15 focus and energy necessary to quantify and model productive ecosystem potential and rapidly adjust the models to new information or changes in circumstance. A free market in risk management can discount the present value of the respective contingencies into a real picture of weighted options. Civil power relies upon third party audit to make reliable investment decisions. If the auditor fails, they lose
20 customers. These are the real blessings of and mandates to personal responsibility, not achievable under a coercive system, wherein people are habituated to avoid blame based upon retrospective experience. There is simply no civic authority that has the ability to manage risk adaptively, compared to free enterprise.

Political motives have historically been far more corrupting than a managed
25 and audited profit motive under the rule of enforceable contract law. Political corruption is usually harder to detect or redirect because the individual profit to politicians or their sponsors can be indirect, non-pecuniary, or hidden to avoid prosecution. Civic regulatory enterprise has the power and scale to avoid scrutiny. The organizational motives of either a civic or non-profit enterprise are thus harder to
30 identify or attribute than is a financial profit on the books of a publicly traded enterprise.

The problem is: What alternative do we have once the corrupt motives and acts of the government/NGO cabal are identified and publicized? Which system is inherently more likely to subject its acts to trustworthy verification?

It is paradoxical that the very scientists who advocate biology education based exclusively upon the theory of natural selection, should also advocate the exclusive use of deterministic management systems for competitive ecosystems. With such ubiquitous examples of successful Darwinian economics, and in the name of preserving Darwinian ecosystems, it is bizarre that a society founded upon free-market capitalism and private property rights has assumed that civic control of ecosystems constitutes a "natural" monopoly. With an unbroken history of democracy leading to tyranny, it is frightening that a successful society, founded upon republican principles of limited government, should justify an irreversible accrual of power in the hands of a demonstrably incompetent and historically destructive master.

Over the last century, there is a record of nearly 100 million civilian deaths, by deliberate starvation and execution, at the hand of their own governments. People commonly respond this historical observation with statements such as "that wasn't our government" and "we have rights," even while insisting upon violation of the property rights of others in order to get what they want. Property rights didn't matter to them when they belonged to farmers, ranchers, and forest landowners, but now that these precedents have given eventual control of the use of all land to government, why should people think that "they" won't come after them and their property?

It is time to break up the civic monopoly in environmental management with the introduction of a capable competitor: the free market itself. The problem with that has always been identification and manipulation of checks and balances within the market with which to motivate the individual to account for externalities associated with their uses of their property. The good news about a free-market management system is that the motives of those in business are less confounded with religion or political power. They are thus easier to understand and structure because the principles are simple.

Markets can identify the means to find financial benefit in the services that land provides, as long as they are free to do so. Under current law, we are illegitimately saddling property owners with regulatory liabilities, while declaring private assets to be public property, confiscating its preferred uses into democratized commons and all too often serving the selfish interest of a few in the process. We all have that compulsive urge to think about what "should be done" with somebody else's land. We want to assume that we have a "right" to dictate the use of private property as a collective good, instead of purchasing a contract for that use. Civic

acquisition robs investment value into those very uses we so highly prize. It is a process of enacting what are, in effect, public acquisitions of what are legally constrained to be zero-priced goods. Once the control of those uses succeeds to a civic agent, the objective means to evaluate and weigh individual cases has been destroyed,
5 devolving to political struggles, as reflect specific interests, not all of which are altruistic.

One would think that highly educated stewards, selling diverse products as appropriate to their unique circumstances, willing to invest their own money, and committed to long-term ownership and the improvement of ecosystem function,
10 would be a good thing. Unfortunately, without at least adequate profitability, that investment won't happen. Does that mean that these investments have to be wildly profitable to make a free market in ecosystem management a reality? How can an environmental management system justly motivate industrial interests to develop an advancing level of stewardship in order to survive? How do motivate the kind of
15 resource management and development that represents the best balance of public need and technical capability? How might a market, trading these products, be structured so that the owner maximizes profit through an objective balance between resource extraction and other productive land uses? How do we do that without the unnecessary cost of civic oversight or possible corruption?

20 **DISCLOSURE OF THE INVENTION**

The present invention operates upon the premise that people make rational choices when presented objective measures of self-interest and that free markets can rationalize abstract interdependent interests via actuarial risk management services or ownership of voting stock. Insured Certification to process standards, as proposed,
25 must supercede civic permit authority for those under coverage as it finds justification by risk reduction for experimental deviation from civic specification. These principles insure rigorous accountability, support responsible expression of individual freedom and protect unalienable property rights. The program can start on a small scale as local enterprises in competition with civic regulation, and displace government
30 regulation where it proves to be superior.

The invention is a business model, capable of financially accounting the objective value of ecosystem resources into the conduct of operations on a dynamic,

iterative basis. That accounting renders ecosystem components and subsystems into tradable assets that reduce the price of risk. Recognition that natural process assets are worthy of investment will induce investors to contribute capital to successful risk-reduction and risk-offset asset-management enterprises. That investment will
5 contribute to rationalizing the highest composite of uses of every parcel on objective bases, eventually rendering civic land use planning completely unnecessary. Voting stock can induce self-interested consideration of others, holding competing assets as overlays within a particular geographical region or spread over the entire planet. Many resource assets are mobile, or have such low unit value that their minimum
10 economies of scale can wildly exceed the bounds of traditional property lines. The solution is to create a property definition of uses of ecosystem *process assets* that transform the state of these mobile resources. Such process units could operate on a noncontiguous, global scale and overlay other economic land uses that may well have their own boundaries.

15 The proposed civil verification system provides privately certified environmental management with an insured guarantee. The certifying body audits practitioners to validated process specifications. A competitor in the verification business has every reason to assure that their customers perform at both minimal risk and cost because they reinsure the practitioners. The program requires continuing
20 research and education on the part of the practitioner toward extending the state-of-the-art of resource management practice. The system generates necessary accounting data to determine the financial worth of insured ecosystem assets at risk, as part of the conduct of certified operations. This is similar to the manner in which industrial insurers developed our understanding of financial risk, through direct measurement of
25 the scope and probability of an insured loss. The practitioner compiles the data from records of habitat restoration and hazard mitigation projects along with the continuing research as required. That data serves other valuable purposes within the system.

This invention applies a detailed structure to identified principles of natural law creating a simultaneous solution to privatizing civic regulation. It explains the
30 rationale for each component complete with necessary checks and balances. These components produce a regulatory system that is motivational instead of coercive by rewarding rigorous risk measurement, creative research, and intelligent risk taking with accountability. The system then produces an iterative loop: identify risks, propose experiments, account mitigating operations, trade in assets that offset that

risk, recombine assets into more productive composites, reduce costs of trading and operations, convert uses as appropriate to maximize total productivity, identify risks, reduce costs of measurement, and so on.

This private system offers a career alternative to working professionals and university academics now working almost exclusively for the existing civic regulatory system. Measurement services, process development, remote land use marketing, accounting and verification services, habitat insurance administration, writing contracts, and managing trades in risk are all business activities that provide new opportunities for entrepreneurs and investors in habitat risk management and land use optimization.

As risks are identified and accounted, investments to reduce or offset that risk become profitable, thus immediately improving the conduct of operations. The use of pooled risk also serves to counterbalance experiments that are more aggressive against those that are less intrusive. Uses of parcels and the nature of risk reduction investments can thus differentiate according to their local attributes. Crude pricing schemes begin to take form with which to trade rights to use those ecosystem assets, capable of offsetting other accounted risks. External assessments of risk and claims against the uses of property are incorporated into the price of either insurance or investments in assets, capable of offsetting those risks. Brokers will offer the services as package deals. Standard units of account will develop through trading. Ecosystem assets can thus have financial worth, as long as they can be bundled into valuable units. To reduce the cash flow requirements necessary for financial viability, one must reduce the transaction overhead of trade, in contracts for the use of these assets. Transaction volume also helps promote accurate appraisal of ecosystem resource value and reduces the cost of administrative overhead yet further.

Proposed applications of the invention suggest specific pilot enterprises with which to address complex environmental problems, many of which have eluded just solutions under existing rule-based systems: timber and fire management near residential development, exotic species control and pesticide management, managing rare and endangered species, and site-specific septic system management. This application for patent includes examples of how the structure of the system produces the ability to manage highly mobile assets such as water quality, migratory animals, ambient noise, or reflected light in the form of a view-shed. This model provides a foundation for the privatization of civic holdings.

The structure of the invention is a synthesis of the following components: certified conduct of insured operations in lieu of civic permit; validated operational processes; audited ecosystem data; valuation of risk via accounting mitigating operations; continuing education and research to extend the state of the art; use of a
5 legal description of ecosystem assets as dynamic models describing bounded processes, capable of offsetting operating risks; and civic respect for Constitutional principles protecting unalienable private property rights. These components are structured in service to the following principle:

*To improve ecosystem health, invest in shares of private enterprises selling
10 uses of natural process assets priced by their ability to offset environmental risk.*

Unlike rules, which are simpler in concept than application (e.g., the California Forest Practice Rules), one does not need to fully understand principles in order to use them. Nobody fully understands gravity, but everybody knows how to use it to the degree that the applications of the law of gravity, as describes its
15 behavior, are understood. Everybody viscerally understands the laws of supply and demand. This invention is structured according to principles of natural law and will thus be ultimately easier to use.

People don't think about natural laws, because they are immutable descriptions of seemingly obvious truths. That doesn't mean that all the
20 manifestations will be simple. The combinations of applications will be as complex as the cost of overhead will support and the ecosystem under management demands.

Under Insured Certification, and with the power of creativity that it unleashes, we might even end up with a futures market in risk related to resource assets. There might be speculative value to be found in the knowledge derived of ecosystem
25 interactions, cyclic weather phenomena, and new mitigation technology. The net result would be that capital would flow to the most valuable resources under the greatest objective threat or opportunity toward improving ecosystem function. The investment would be more cost-effectively focused toward reducing the scope of the problem and its associated risks.

30 Without objective means we cannot determine the relative value between a wetland on the edge of an urban bay and a corridor among high desert communities. Professionally trained ecologists would have an advantage in property markets because of their ability to manage ecosystem assets. Do the people who are currently busy fighting landowners and pushing paper in government want to join the living and

start a company? Will the government make that happen? If we shut down the productive assets of the nation how then would such work be financed?

BRIEF DESCRIPTION OF THE DRAWING

5 The appended drawing is a general schematic of the present invention to assist the reader in understanding the concepts discussed herein.

MODES FOR CARRYING OUT THE INVENTION

This description begins with a dual system to manage the externalities of resource industry operations. It suggests an optional free-market system in competition with civic oversight. This motivational system audits practitioners to a
10 validated, best-practice processes standard, maintained by a private, insured, third-party certification enterprise. Public acceptance of private certification in lieu of permit authority can be an incentive for a company to adopt practices so excellent that civic authority is superceded by the demonstrably superior performance of the certification process, which settles disputes via civil liability and contract law.

15 There is no unequal treatment under the law in this proposal. It is within Constitutional bounds to allow quality systems, demonstrably superior to those set by law. Any person, corporate or individual, who could prove the excellence of their operation under a guarantee, as assured by a certifying company with financial responsibility for audit to validated process specifications, would qualify for the
20 exemption from the civic enforcement protocol. Generally, the practitioner agrees to: operate under documented, guaranteed, and validated process specifications; obtain insurance to repair, mitigate, or offset externalities; and improve best practice through education and scientific research. The certifying company agrees to: audit validation reports against conditions on the ground; carry reinsurance in case of insufficient
25 indemnity or bankruptcy; coordinate data and supply composite data; and manage complaints and arbitrate primary settlements. Please consult Figure 1.

The certifying company would reinsure the already insured guarantees provided by the certified practitioner. It will be financially liable for its own verification and auditing practices and would have to carry its own insurance. Pooled
30 risk is a more efficient use of capital than the existing system of putting up barely

adequate surety bonds for permitted projects. There is also a means to address the actual scope of the claim. The certifying entity can independently verify their customers' practices without requirements for hierarchical traceability to a national or international civic authority because they have a stake, both in the success of their clients and in maintaining low reinsurance costs on the integrity of their verification services. Both have every reason to reduce their insurance payments by reducing the scope and frequency of claims. The system is, therefore, self-correcting. The guarantees, offered by the system, thus enjoy multiply redundant coverage.

According to the present invention, commonly referred to herein as "Insured Certification," there is no incentive for a certifying company to burden or extort funds from their customers. Unlike certification as currently "accredited" under the FSC, this is a competitive market where the certifying agent has a stake in both customer success and minimal risk of a loss. The necessary checks and balances in this system have multiple backups. This lowers required capital and pools risk further. Insured Certification also holds practitioners to a standard of continuous research, education, and process development, without requiring civic funding of the research. It will do a better job of allocating research funds toward problems, with technically justified environmental returns.

Once freed of the costs and delays in obtaining permit approval, insured landowners, farmers, foresters, ranchers, and timber operators will have the better opportunities to take advantage of the spot market. They will have advantages of higher margins, lower operating costs, and efficiencies in inventory management with which to offset the costs invested in best practice management. It would help attenuate the price spikes that tend to motivate rapacity on the part of others by satiating transient demand and would reduce the temptation to overextend the resource to cover costs under falling price conditions.

Part I: Insured Certification to a Best Practice Process Standard

Once an owner or operator proves that produces results meet specifications, the only claim to be made is that the work isn't excessively destructive as determined by the local authorities. The output can only be defended in terms calibrated by the degree of harm. Whether the result is in fact, minimally harmful, or perhaps beneficial, harm remains the currency by which the results are subjectively evaluated.

The best practice regimen, as discussed, focuses instead upon continuing education and the collection and dissemination of data for these very reasons. It is intended to build the understanding of externalities such that competing considerations are weighed accurately.

5 Why not have a certification ethic that, instead of obsessing on minimizing harm, focuses instead on knowing that the work being performed is the best that can be performed among its multiple purposes and advances the state of the art to improve the total performance of the asset? The objective of validated process design and development is to have a means to assure that, not only do continuing operations meet
10 the highest standards, but that new technologies have a high probability of low risk and high return. To incorporate consideration of externalities by insured guarantee is to assure a rigorous test for an idea, to see if it is worth the risks, and to set aside appropriate funds to cover the unexpected.

Insured Certification is just a way of using capital and verification services to
15 manage the risk of human error or unforeseen circumstances. Insured certification is not NGO-based; it is instead, entirely business-based. There is no international governing body other than the stock market to hold this system accountable because, if the certifying body does not do a good job, they get to file for bankruptcy and the reinsurance company guaranteeing the certifying entity gets to pick up the tab for the
20 fix. That fact deepens the financial redundancy to three levels, assuring public confidence and maximizing the efficiency of pooled risk capital with a multi-layered structure of accountability.

So far, there is not a certification program in the world that has any real market benefit for its customers. Insured certification is alleviated from restraint of
25 trade entirely by its civil account of civil financial responsibility (similar to UL) and its documented and validated record of best practice. Its customers are deemed insurable by their subscriptions and behavior. Nor is there requirement for a single definition of what constitutes "best practice" or a single vendor of insurance – quite the contrary, it is necessary for there to be competition toward that continuing
30 purpose.

Let's examine the attributes of the system in detail, as applied to forest management.

An Illustrative Introduction of the Structural Components: Forest

Certification. As was discussed, certification of timber practice and forestry already exists, but there is no unifying effort to render it accountable or reduce the influence of civic authority. As it is now, a certified forester, operator, or landowner has to
5 maintain comply with both regulating bodies in the hope that consumer demand for environmentally sound practices will pay the higher price for their products. So far, the consensus is that private, third party certification doesn't work for the customer because such pricing premiums are small and the chain-of-custody requirements are odious and counterproductive.

10 Under Insured Certification, civic permit authority would have competition in the verification business. It could then focus its energies on maintaining oversight over a smaller population consisting of marginal, average, or habitually non-compliant practitioners. Thus, there is both a market incentive for the contractor to be impeccable and a competitive incentive for government to improve its efficiency.
15 Further, under Insured Certification there is market incentive for the practitioner or landowner to hire the services of those who would do technical research to patent innovative certified processes. It is possible to reward trustworthy behavior and assist those who want to do the best that can be done. It is high time that integrity was rewarded in our society. The alternative is inherently corruptible.

20 Who oversees government? Do voters understand the issues or verify the record? There IS a record of corrupt officials looking the other way in enforcement matters the world over. The U.S. Government has already been determined to be liable for over a trillion dollars in cleanup costs for its own operations.

Civil liability can invoke increased focus on risk reduction process
25 development and loss prevention because profits are at risk and people lose their jobs if it is not done. Competitive, insured, private certification could provide the incentive to measure and define the limits of liability as well as adhere to and improve preventative practice. Competition in the marketplace assures that it is done at minimal cost.

30 Insured Certification can eliminate time-to-market delays associated with civic permitting. The benefit is similar to that of a manufacturer and supplier using Just-In-Time (JIT) inventory control systems. Applying JIT to forest management would eliminate response instabilities induced by permit delay that cause frantic over-harvesting to satisfy a starved market. JIT allows responsible foresters to take

advantage of transient peak prices. JIT systems reduce capital requirements in two ways: they lower the physical capital required to maintain physical and regulatory capacity for peak production rates and reduce the stored inventory required to meet instantaneous demand. Adoption of these systems would therefore reduce the total
5 volume of trees cut and sold at discount. These benefits are important in the lumber business because green lumber otherwise has a long lead-time, short shelf life, and high inventory cost.

The time is ripe for insurance, priced by behavior, to replace oversight by criminal penalty or waiting for rulings from inexperienced, understaffed, opinionated,
10 and possibly corrupted inspectors. The key to its eventual success will hinge upon how it is implemented. The following discussion illustrates the components of this invention:

Defined Accountability. Accountability should be identified and the limits of authority documented for each job. This is another situation where the certification
15 process has real advantages over the existing system. The Registered Professional Forester (RPF), the Licensed Timber Operator (LTO), and the landowner would be free to define the structure of responsibilities if, for example, they are among the same enterprise or work for separate firms. This reduces ambiguities in the chain of command on the job and allows for redesign of the structure appropriate to the
20 specific job or the skills of the individuals involved.

Meets or Exceeds Specified Practices. This is a transitional idea for activities not traditionally certified. An enterprise that has maintained and advanced best practice standards for a few years will naturally have deviated from civic specifications where justified. The specification criteria would then adhere to the
25 validated process standard, instead of those defined by the certifying body, or state specification.

Validated Practices. Validation is the means by which a practitioner measures process inputs and behavior against its outputs to acquire knowledge sufficient to operate the process deterministically. There are three types: retrospective,
30 concurrent, and prospective.

Retrospective validation examines system outputs and correlates them with measured system inputs to determine if the process is meeting expectations. Concurrent validation measures critical variables of processes while they are in

operation to assure that each is delivering intermediate results within expectations. Prospective validation operates with the knowledge that so much is known about the process, its operations are under such control, and results are so predictable, that only monitoring of process inputs and settings is necessary to achieve desired outputs. A
5 manufacturer usually starts with retrospective validation, incorporates concurrent, and works toward prospective.

Validation is not typically used by the resource management industry. It is, however, essential to this invention. The problem with implementation is that people who try to do good work take pride in it. They resist challenges to their integrity and
10 expertise. They are also rightly concerned about a potential source of blame. No one can honestly know the quality of their work without monitoring results. The requirement of the current law governing forest practices is that the licensed practitioners are accountable for their work for three years after completion. Given that the jobs are often fifteen to twenty years apart, this is a farcical standard. The
15 question falls to who should be accountable for, and own, the data.

It is not recommended that any single job function be accountable for collecting data and record keeping, only that accountability for doing so should be defined and verified by the project participants. Let them figure out how to collect it efficiently, document, and validate it. The work can be performed under the control of
20 the landowner, the forester, the harvester, or all three. What matters is defined accountability, quality of data and effective risk management. Up until now, landowners have been afraid of data and scientists, and for good reason. Why should they want to know they have a unique plant, pathogen, or insect on their land when it represents an opportunity for government to gather information to be used against
25 them and force them either to forgo operations or to undergo an expensive fix? This is a legitimate fear when the activities of resource agencies often rely upon fines as a source of operating revenue. Given the motive for subjective or selective interpretation of overlapping and contradictory rules on the part of civic enforcement agents, it is no surprise that such concerns exist. We should not expect people to
30 comply with laws that require knowledge to the limits of science unless we have a system by which rewards acquiring, applying, and extending that knowledge.

Collecting data is expensive. One way of making continuous scientific data collection more affordable is to trade it for the dispensation Insured Certification offers from the paperwork, delay, and political or legal battles attendant to civic

management. There is a need for biotic map information, plant census and survey data, geological mapping, documentation of insect populations, or maps of infestations and pathogens, including external threats. The list could become extensive over time. Imagine how useful it might be as a way to identify the origins of an exotic pest vector or plant disease so that it can be treated early, or at least observed in progress. Little erosive rills and cuts could be found before they were notch stresses and landslides. When the recorded data are related to the proper fix, they can become part of future internal process specifications. Results of controlled burns could be incorporated into the knowledge-base to learn how often, how hot, and at what time of year a controlled burn should be and how to best to control each type. This is a huge opportunity by which to develop fuel control and fire management processes.

Data collection may cost a lot but so does the uncertainty when managing pooled risk. In this system, there is motive to collect information to reduce the cost of actuarial uncertainty. Validated practice builds information that can prevent problems from developing without requirement for unproductive paperwork. It is the foundation for the education processes that lead to an owner's operating manual to the parcel. It is a format to record the progress and control of pest infestations. It is a reporting system that eases integration of multiple uses. It is a basis for communication and marketing habitat attributes. It is a way to assure competent ownership, should the land pass among owners or generations.

This is where the Insured Certification system has advantages over existing verification services. It calibrates *relative* risk and facilitates consideration of how local uses of resources figure into potentially global impacts. It unitizes constituents of risk to render the assets that offset them, tradable. The key is the collection and organization of data. The data is the foundation of new environmental management markets. One cannot financially value the elements and interactions of ecosystems, without the understanding that comes only with the creative focus that a profit can motivate. One cannot weigh competitive claims upon ecosystem resources objectively, without calibrated evaluation of respective risks of loss.

We can put certification systems in place as a carrot for permit dispensations, but without an extant format for the structure of research information, it will be very difficult for that information to have a practical use beyond the bounds of the property. More people doing that work will reduce the cost, improve the tools, and

improve exchange of information. This is a demand potential for improved measurement devices at lower cost and software products configured for cataloging this kind of information.

Documented Design Processes and Project Hazard Reviews. It is hard to
5 convert knowledge into the written word. There is a series of uncomfortable moments when one must discover how to express something. Writing a process document forces one to confront how little one knows about what one thought one understood.

Formal hazard reviews are something with which the chemical processing or biotech industry is intimately familiar. If they don't think of everything: trace every
10 pipe, valve, circuit, operation, software command, and possible out-of-bounds chemical reaction, the plant blows up, people die, lawyers come running, TV reporters ask ignorant questions and get unflattering pictures... Nobody likes chemical plants that blow up (especially insurers) except ambulance chasers and TV advertisers...

Environmental problems are easier to attribute and harder to prove. They
15 usually involve a tremendous number of variables. If, after a timber operation, there is a landslide, people die, lawyers come running, TV reporters ask ignorant questions and get unflattering pictures... The only difference is that with chemical plants we know that there is an assignable cause that can usually be determined after the fact. It isn't so easy with timber operations because we are so ignorant about natural
20 processes. Sometimes a bad situation in nature has a high probability that it may "fail." Is the cause of the problem assignable? This is where the hazard review becomes essential.

A classical hazard review process includes a time when all the data, accumulated during preparation for the job, can be rolled into the file on the location,
25 any necessary revisions to process documents incorporated, and action items for needed hazard mitigation generated. If, after the slope eventually fails, one conducts a "post mortem" on the event by consulting the review history, one can then accurately recall if the risks were correctly accounted and a better job can be done next time.

Hazard reviews are that moment when we ask: 'Did I forget anything?' 'What
30 is the cost of failure?' 'Do I need any resources?' 'Should I notify anybody of that risk?' They are essential to successful low risk operations. It is this process of hazard review that builds the project record-keeping that renders risk more predictable and identifies opportunities for improvement. Hazard reviews dovetail with the insurance

aspect of the program yet to be discussed. Hazard reviews are the documentation of the risk factors that are to be weighed before the operations begin. If the situation involves an unstable slope that is showing signs of failure, the review documents the risks, properly assures that due precautions are taken (such as notifying people), and
5 attempts the best mitigating steps under the circumstances. It may be the best that can be done, even if the slope fails. At least there is a way to pay for some of it and reduce the cost of the inevitable.

A Record of Continuous Improvement. If an industry's operations involve "The Environment," government does much of the research and development for
10 "free," whether it is timber, agriculture, or fishing. Look at the list of industries and consider their relative prosperity. The incentive for government employees to expend that research toward developing new regulatory markets is so strong and the job security so attractive, that the research product diverges from its mandate, in order to expand civic control of resources.

15 Qualification for certification should require private conduct of, or support for, research. The research can be as simple as that being done on truck tire pressures and soil disturbance. That Big Creek Lumber Co. supports the Monterey Bay Salmon and Trout Project on its property qualifies as an example. There is no reason that active participation in a trade organization coordinating the work couldn't qualify as long as
20 the results were being incorporated into the best practice standard as applies to the practitioner's site.

Continuing Education and Publication. This system requires maintenance of documented records of research, development, publication, and adoption of improved methods and practices on all levels of the enterprise. Education and training
25 is key to achieving these goals because it provides the means to verify that processes or experiments will be performed as planned. Only then can one develop proprietary process procedures as intellectual property.

Everyone acknowledges the value of education; everyone hates the cost. Everyone acknowledges the career benefits to publication; few take advantage of it.
30 The process has been of benefit to every profession. The problem has been that, if one company institutes an expensive technical training program, other companies hire the people away. The biggest benefit of training, heretofore, has been problems that do not happen because of the education of all the people on the job. To this can be added

to the best practice benefit of permit dispensation resulting in steadier employment and a safer place to work.

Would it be useful if a tree topper understood arboreal pathology and reported data on the way up the tree? Could we train cat-skidders in a smattering of geology, hydrology, and tree root pathology so that they can perform data entry and identify potential problems before they rip into them? Would it be worth the money? The validation step is a check that provides the data. Without that internal confrontation, a training program is a pipe dream.

There is a reason that private forestry so seldom publishes process data and experimental results: It is proprietary information. The nature of the industry makes it terribly difficult to protect intellectual property. An open standard, interdependent stock ownership of overlapping land uses, a financial motive for licensing processes, and a means to verify legal acquisition of proprietary processes will produce motives for marketing proprietary information that is related to production from that which relates to overall forest health. Better comparative and validated data, will help verify whether an intellectual property asset has been infringed. Auditors would have professional liability for inappropriate disclosure.

Operational Transparency. The single biggest problem with public resistance to timber harvesting is the fact that the public does not know very much about it. This system requires the practitioner to notify the public of the project, record concerns, and respond. If there is a dispute, the documentation of notification is already in place. It is cheaper than a week of delay on the job or one day spent in a courtroom. If the local foresters got together on an information package it would not cost very much.

There are foresters that have made an effort to educate a neighborhood prior to a job and regretted it later. The pitfall to the idea has been that if a neighborhood is brought together and educated, the act and fact of the education can organize the opposition. The activists get wind of the notification, feed the fear to the homeowners based upon at least misleading information, and provide assistance with a legal battle over the job. This certification system proposes to eliminate that concern as follows:

1. There is no permit appeal. The certified practitioner would have a process for addressing complaints. If that response is not satisfactory to the activists, they would have to take complaints to the certifying body that would have the independent expertise

with which to evaluate the case against the audited record. They can record the claims of the activists and would have civil recourse to recover expenses related to false claims. They can also tell the neighbors that, because of the documented record, the likelihood of a problem is so small, that a claim would have to develop before the certifying body takes action. If there had been an unusual risk, the cost of job insurance would have been negotiated. Remember, sometimes a risk exists whether anything is done or not. Often, forestry can mitigate a risk. This is not about a perfectly safe world. It is about defining systems with which to best manage that risk.

2. Process validation provides the certified practitioner with the historical record of practice with which to refute improper claims. This is a long-term process requiring patience and documentation. The speed with which the job can be done and the reduction in unnecessary bureaucracy will offset some of the costs of additional data collection.

3. Process validation provides a format to compare prospective risk. Site-specific records can be applied to assess both to future proposals and to meet the verification standards of certified audit. It also forms the basis for discourse among landowners and a future market in ecosystem assets.

4. Transparency to audit assures that intellectual property is respected. It preserves property rights to data that drive technical innovation and the privacy of landowners undeserving of specious accusations.

Transparency does not mean that all data (particularly raw data) belonging to the practitioner or landowner are available free to anyone. It does mean that the composite audit to validated practices, complaint and resolution records, and experimental results are verified by the certifying entity and that the verification record is available for inspection. Perhaps composite data of various owners and practitioners for purposes of furthering general research might be available from the certifying body. The rest is at the option of the insured because it is often proprietary information.

Adequate Capital and Insurance. Insurance companies will have to learn to price this kind of product. In most cases, the cost of a potential loss is estimated from the cost of historical mitigation operations. That information is generated out of the insured certification process itself. This process iterates an ever more accurate estimate of the value of intangible assets.

None of the recommendations in this application are terribly complex

manifestations of the proposed system. There is ample risk of capital loss associated with existing civic environmental management to interest the participation of insurers. These introductory products and markets will create the opportunity to learn how to price and finance risk reduction, as part of best practice management. These products
5 can then differentiate into new markets over time. That is the beauty of incremental implementation. The insured best practice management system proposed here can gradually supercede regulatory management as new products and processes are proposed, tested, and improved.

One objective of the design is to assist the landowner and practitioners under
10 contract to organize in such a manner as to minimize overall risk. The certification process must, therefore be about how these people go about learning and verifying experiments to determine the best available options and assess the quality of risk analysis on the part of the practitioner. What follows is the mechanics by which to price that risk.

15 **The Price of Risk in the Cost of Goods Sold.** This discussion will start at the level of the individual resource enterprise and demonstrate that, at even this simple level, Insured Certification has immediate benefits. Yet the effects of the system go further than to assure mere accountability. Besides the obvious benefits to be realized with a motivational system on the individual level, the benefits of the system extend
20 to novel management enterprises on a much larger scale with individual products priced by their capability to offset measured risk. Though it may be decades before all these benefits can be realized, the simplicity of the system assures that it can successfully manage large and complex demands.

Insurance performs many economic functions in a market economy beyond its
25 primary objective of indemnifying potential losses. The cost of capital, used to offset risk in the production of a product, incorporates consideration of that risk on the part of the buyer. The buyer of a product doesn't need to know how safe the factory is or if tornadoes or droughts are a high probability in its production. They automatically weigh that risk against both competitors within that industry and the relative benefit
30 of substitute goods. They don't need the equivalent of a "green label" or a certificate on the package for these risk factors because the cost of risk management is included in the cost of the production.

Our knowledge of industrial insurance pricing has evolved over a long period.

The insurance industry has historically derived its estimates of the risk of capital loss by factoring the present value of the asset at risk against the estimated probability of a loss. Early insurance markets for cargo shipments estimated bids for insurance contracts using the construction cost of ships, the price of their cargo, the history of losses in transit to particular destinations, and news of currently prospective risks. That data also directed efforts to reduce the cost of mitigation and lower the probability of loss, thus lowering the total cost of risk. The process has continued for centuries and has involved a huge number of iterations constantly reevaluating historic risks against those associated with new information. The result has been improved reliability, safety, and reduced cost of industrial products, while simultaneously managing the pool of risk capital more efficiently.

Let's examine the principles of asset value and loss probability against the historical industrial example to see how they might be applied to environmental management in two recurring phases:

First: Estimate the value of assets at risk from the cost accounts of acquisition combined with the settlement records of related losses.

Actuaries must have an accurate measure of the replacement cost and market value of the insured asset in order to price their risk management product. The financial arms of insurance companies are not, however, experts in auto mechanics, medicine, construction, or law, much less the specific process practices of the insured. They don't understand the cost of nails, the price of bandages, or the cost of downtime in a chemical plant; instead they have access to the audited accounts of the insured and similar records of operations of other enterprises. If they require outside information, they can either permanently hire or consult as required in order to render technical information into both accurate estimates of asset value and probability of objectively defined, accounted, and attributed harm.

Raw data for the calculation of financial risk is derived prospectively, retrospectively, or experimentally. Prospective asset cost information is acquired through analysis of the proposed design and construction costs of physical plant, and estimation of the extent of damage due to types of possible incidents as part of a hazard review. Often, an analysis requires independent verification of experimental or design data. These values are adjusted with other prospective expectations such as interest rate and inflationary expectations, and estimates of functional life versus product life cycle. Retrospective analyses include historical construction costs of

similar assets, profit and loss on continuing operations for the analysis of business interruption insurance, and histories of legal settlements.

Asset risk assessment must consider the cost of loss mitigation. These include assessment of physical assets such as estimates of useful life, and residual value, and
5 human resource assets in medical care, training, and rehabilitation. Accounted mitigation costs are particularly important where the loss is a significant fraction of the operational asset value or where it has subjective market value, as in the case of human pain and suffering. In any of these cases, audited accounting data provided by the insured or usual and customary settlement costs are critical to deriving "higher
10 order" insurance pricing information.

Second: The probability of a loss is projected from real time inputs and historical records appropriate to the attributes of the asset under coverage.

To assess a risk requires not only analysis of the capital constituents, but also computation of the probability and extent of a loss. Whether it is frequency or severity
15 of floods, tornadoes, or trucking accidents, pricing the risk of loss is related to how often, and under what circumstances, losses occur. Probability of loss is calculated from the frequency of claims attributed to causes such as accidents or natural disasters. Other estimates are derived from laboratory experiments conducted by institutional organizations. (Underwriters' Laboratories has developed invaluable
20 technologies investigating causes of failure and means of risk reduction by experiment.)

If, for example, the insured risk is earthquake damage to houses, one can mitigate risk by building better houses or choose to build them elsewhere because the cost of earthquake insurance is too high. The key to the decision is to understand the
25 costs and probabilities associated with the total set of alternatives. Estimates of the risk must derive from historical data on the earthquake frequency and severity and the resulting damage, or experimental data on various methods of house construction and the local cost of construction or repairs. Without that data, we cannot estimate the risk.

30 Analyses of pooled risk have had severe limitations when attempting to estimate large financial risks to the individual owner. In many cases, insured losses among many customers are actually more predictable than a sudden financial catastrophe for a single entity. This is particularly true in the case losses for which there are no historical bases. The market is developing a full range of financial

instruments that extend from the simple probability of an insured fire and casualty loss to tradable options on purchased financial outcomes. It is increasingly common for large corporations to purchase insurance against an unexpected financial loss or even the impact on stock prices of earnings below projections. The market prices of these options readjust constantly as new information changes the probability of a particular outcome. In this way, general knowledge of market behavior can be applied to specialized cases through successful hedging of pooled risk. Current research is focusing upon how to integrate a total population of transactions such that general knowledge can be correctly applied to particular cases; in other words, how to broaden the pool of applicable data. An example is analysis of research and development investments with high risk of failure, long lead times, or a substantial risk of premature obsolescence by competing technologies, as for example in the development of prescription drugs.

Even if resource assets, such as individual forests, are not at high risk compared to insuring profit expectations in the prescription drug business, there is no reason that similar analytical instruments cannot move down-market as the cost of computing drops and the accuracy of estimated losses improves. The models and computational tools exist or are developable; what we really need is infinitesimal data: the nails, bandages, and labor hours, of pricing environmental assets. That is where the design of the current invention to motivate collecting that data has its greatest advantage.

Landowners own the source of that data but haven't measured it in great detail. The Insured Certification process generates that information by using a similar combination of asset analysis, loss history, and experimentation to compile the cost of environmental risk, as did the development of classical insurance pricing. It starts with tangible and recognizable economic risks and motivates the development of appropriate financial risk management instruments. That the risks can be weighted and reduced by the behavior of the insured renders the system a just means of incorporating the cost of externalities into the cost of goods sold. With this invention, there is motive for owners to generate the necessary source data even before it is consolidated into higher-order information.

The Operation of Insured Certification to Price Risk. The Insured Certification process operates as a positive feedback loop to lower the cost and risk of

hazard management and mitigation. It simultaneously generates the data that accounts the cost of risk and identifies risk-offset opportunities. There are five aspects to the invention that bootstrap the proposed environmental risk valuation mechanism:

1. The best practice standard includes research, data collection and accounting, and continuing education. It directs the data acquisition of environmental knowledge toward means to reduce risk. The data thus has leverage both toward the immediate resolution of problems and the accurate characterization of their cost. The companies in the certification business will want to charge competitive rates. The entities responsible for verifying the conduct of operations thus have a stake in customer success for two reasons. First, they need to minimize the overhead cost of verification to be competitive in the price of certification services. Second, they don't want to pass the higher cost of their insurance premiums onto customers because they had suffered too many claims against their auditing and verification. There is a reduced motive to over-state a loss on the part of all parties involved because of the risk of a higher price of coverage. The system is thus bi-directionally self-regulating, similar to other insured industries.

2. Process design control produces more rigorous experiments toward improving the limits of practice. The dual verification systems of certified financial accounting and audited process standards assures that Insured Certification processes are capable of delivering reliable data. There is no reason for the insured not to market mature process designs as long as the reliability of the system assures low risk and there is a way to assure respect for intellectual property.

3. Risk management, based upon multilevel insurance, places a cost on risk that a prudent investor in process knowledge will seek to reduce. This leads to investment in research designed to reduce the probability of loss and improve the productivity of a mitigating asset. In the case of forestry, these natural process assets include those that support and depend upon the growth of healthy trees.

4. Verify risk reduction history to justify lowering the price of insurance. That takes data and start over. The logic here is thus a program loop, with a decision point:

Once risks associated with continuing operations are reduced to the point of diminishing returns, what is the practitioner to do with this "stupid" Insured Certification requirement to keep studying and collecting data?

Apply the research and continuing education toward an ancillary ecological

problem or new opportunities on the property in terms of how it interacts with its surroundings.

Here is where the results of continuing education and research come into play. One may have been learning about losses of endangered species due to predators
5 based upon data discovered during regular operations. Given the losses the price for coverage of the remaining population might be high. Once a way to reduce predation is found one could sell that information to help get the species delisted. One may have been learning about the cost of weeds based upon the labor expended for control. Are there better ways to reduce seed transport? Should we use a pre-emergent when
10 washing heavy equipment? Once these questions are asked, concerns about the manner in which the surroundings affect the operational costs are considered and with it the opportunity to consider the interactions of the property with the rest of the planet.

This is where the Insured Certification regimen motivates discovery of
15 environmental business opportunities to market solutions to larger problems. The program gives both the practitioner and owner reasons to learn and motive to experiment while maintaining consideration of the risks associated with deviation. It gives the certifying entity a reason to assure continued reduction of risk. It induces scientific experiments and the desire for accurate data.

20 Is it possible that the manner in which experiments are conducted, could start being distorted by more transient forms of self-interest. Is this a problem? Are we concerned with the nature of the practitioner's perception, skewing the objectivity of the data? Perhaps. It is common to ask a forester a question about forest health and get an answer back in terms of increased timber production. That is, after all, what they
25 get paid for. If however, they are paid for what was a more integrated perspective of total ecological health because there was a cost of risk in continuing operations without that consideration, the answer would reflect that broader perspective.

The Need for Free Experimentation. The insured certification and best practice standards motivate differentiation of management methods to reduce risks.
30 Intellectual property laws motivate licensing and dissemination of the knowledge acquired. Competition selects the best methods and rewards the inventors. That process reorients research to objective goals.

Many factorial designed experiments have too many variables to be

practicable. These circumstances call for crude screening trials and acts of what might seem to be spontaneous judgment. To identify control points or process limits, one must occasionally be free to push a variable to the point where the process fails. It is akin to analyzing automobile design safety by studying crash data. If the person doing the work cannot be trusted for fear of harm, that research opportunity is lost. A motive to profit by mistakes helps capture that data and communicate it to others to render the trial or record useful, confine the scope of the experiment, and prevent anyone else from making that error. Performance specifications, particularly those that are risk averse, will never allow such things. They are simply too rigid to perform good science.

An example in forestry is the clear-cut. There are experimental data suggesting that, in some types of forest, a clear-cut with an extended reentry time is preferable to selective harvesting. In other types of forests, this could be an outrage. If the governing body specifies group selection harvesting methods and uneven-aged forests as an output for all forests, one may never know which system is better under local circumstances. If instead, the landowners propose an array of approaches, with independent monitoring, out of a verifiable effort to prove how best to manage each location on their property, why should they not find out? All that remains is to determine how to reduce, pool, or offset the risks involved. This is where the hazard review and pooled risk offsets under this invention become essential.

Meadow species in many areas are truly threatened, far more so than forests. Meadows are principal stores of biodiversity and are the reserves of species that repopulate a forest after a fire. Meadows are threatened by development, succession after fire suppression, and by exotic species. Meadows are cheaper to develop for housing and erode relatively rapidly. Historically, they were first under the bulldozer. Given the history, we may need to create a few meadows artificially that might serve as fuel-breaks for prescribed fire control and to maintain and distribute replacement species. Would landings do under some circumstances? It could well be that, under some circumstances, concerns about forest "fragmentation" are more figment than fragment. What is the risk for each situation? If a "rolling wave of succession" method of forest management were proposed as a controlled experiment, what would it cost to mitigate?

Such an experiment as a clear-cut would come at higher risk and therefore, cost more to insure. This is how insured certification offsets the desire to invent

pseudo-experiments designed to maximize the take from the land and lower costs for those who would do otherwise.

Best practice may well change over time, in fact it must. Climate change, natural disasters, and changes in technology will force such continuous development
5 anyway. Would it be preferable for us to have proven contingent process systems in place for the adaptation to changes in external conditions compared to universal government policies? What if somebody invented a machine that could harvest a redwood by merely ripping it out of the ground like a large garden vegetable and thus simulating the fall of a mature tree in nature? Should we grind some of the stumps
10 instead? Should we replace caterpillar tracks with walking machines? Would it be worth it to reduce skid trails or reduce seed transport? Could we make biodegradable foam curtains or blankets that would contain prescribed strip fires at a riskier, but more biologically appropriate times of year? How would we best use such tools and what problems are we trying to solve? The process of continuous investigation is the
15 way such questions are generated and answered. None of these problems are solved unless we allow the questions to be asked. The measurements will be meaningless unless they are motivated toward useful purposes, else the answers will have no correlation with the actual conduct of economic operations. Productive purposes are essential to discovering the wealth of knowledge unforeseen, in part, because the
20 experiments are investments in profits that fund more tests. But what if the experiments don't work?

Learning from Mistakes. Reversing course costs time and money. Mitigating environmental risk in private hands accounts the price of offsetting the cost of errors and disasters. This improves the accuracy of estimates of the price of environmental
25 risk.

Suppose we continue with our grossly oversimplified example: Let' add a clear-cut across the forest front to a landing to create an indigenous meadow as a natural firebreak, seed reservoir, and access area, leaving a functioning succession process behind like a waveform over perhaps hundreds of years. We root out stumps
30 and hire an expert botanist who plants native grasses, locally collected wildflowers, bushes and broadleaf trees. Let's assume that we get an infestation of star thistle from a dirty tractor that dried out all the natives and killed them in three years. As an experiment, it was a failure. Now what? Sterilize and replant meadow, or replant a

forest. Let's say we doggedly do the former. Now we find that we have a nifty firebreak, a great tractor washing process, and know a great deal about the process of meadow species propagation and succession, and even more about how often to weed, based upon the type of infestation. There are other problems, however, when it comes
5 to weeds, the birds and deer bring them in anyway. It's a flop.

What about a forest? It is going to take over a hundred years before we get back to where we were and with significantly reduced productivity during the interim. We plant the trees, protect them from browsing, get them growing, and do the requisite stand improvements for 50 years. We also have to devise some other way to confine the
10 prescribed burns. The whole time, we keep track of the cost under a project authorization. The costs? There was lost income and increased insurance, the prescribed fire experiment had to be written off. At least we can sell the results of the experiment to an insurer or forest owner who wants to know what the risks are in trying such a thing. Perhaps someone else has a few ideas how to prevent the problems we had. Their insurer
15 might pay to know what the worth of the risks might be. The experiment also demonstrated how large the risks are to intact and pristine meadows because now we know more what it costs to try to make one.

Under Insured Certification, much of the actuarial cost data will be derived from compiled financial records of mitigation projects such as our forest experiment.
20 Learning the cost of repair is key to learning the cost of risk. The landowner then has reason to accumulate data, not only on products that have tangible resource value (such as timber), but also on the other physical and biotic attributes of the property that someday might have such value. As these are catalogued and measured over time, the processes particular to that location, by which its attributes transform the state of
25 commons, become apparent. That leads to a process of discourse in higher level functions with other participants with commonly held assets. It identifies those whose behavior is a threat to those assets. Such processes of communication lead to negotiations by which to weigh their relative value and offset the risk. The market can then adjust prices whether due to disastrous experiments or successful new
30 developments in risk reduction methods.

Insurance, Warranties, and the Like. Manufacturers who guarantee a product are bound by their promises and pay damages if the product causes subsequent or collateral damage. Insurers have to deal with uncertain outcomes

among unique circumstances. They are masters of the actuarial mathematics of probability, game theory, statistical uncertainty, and hedged sets of possible outcomes. The market has modalities to deal with the risks associated with managed ignorance and is thus well suited for ecosystem management.

5 Competitive pricing of risk in habitat management is environmentalism with an insured guarantee. This proposal allocates managed funds to redress mistakes if they occur, and regulates behavior with the price of risk. Insured Certification can do things that government never will. It can guarantee a degree of efficacy of practice. It motivates all involved to minimize the damage due to a disaster. It can offer protection against
10 collateral damage. It can efficiently manage risk capital. By contrast, government assumes no liability associated with its monopoly to verify conformance to its own specifications. The government will provide FEMA after a disaster and fix problems, with borrowed money after the source of cash flow has been destroyed.

Many major insurance companies are short of both new markets and better
15 margins. Many others are looking at enormous liabilities in regulated markets with no means to manage the risk. What is lacking is the data to move into such markets or, an idea of what the limits of liability are likely to be. Insurers are not familiar with either forests or the costs of mitigation of environmental hazards associated with timber operations. They would have to acquire that data over time and through research.
20 There will thus be a motive for a more intimate relationship among landowners, practitioners, and insurers. All it takes is the will on the part of people to get the insurers out of their protective shell of regulated pricing and into the businesses of risk reduction and financing. Society would be richer for it and so would the health of natural habitat.

25 The insurance industry rightly fears the possible magnitude of liability for economic externalities related to the environment. Society has reverted to regulation, in some respects out of the need for "protection" from political valuation and the greed of rapacious lawyers. Civic regulation certainly lowers the overhead required for objectively evaluating ecological risks because it doesn't get it done. In that respect,
30 civic accountability could operate as a subsidy, but from a perspective of total cost to society, it may not be a safe risk.

Insurers currently risk catastrophic financial loss due to an underbid regulated market. The problem is that every time there is such a loss, government raises the rate base to protect the financial solvency of banks and everybody goes back to what they

were doing without accountability to shareholders or dealing with systemic causes. Why should the public support such a systemic misallocation of capital? Political pressure groups claim that to allow insurance companies to measure and price differential risk based upon behavior is unfair discrimination. However, we end up
 5 protecting the very people who funded the tax-exempt foundations that supply grant money to the pressure groups! It makes an interesting test of industry claims that bank and insurance regulation is so often unjustified. What unfortunately happens, is that we collectively lose wealth and cause environmental damage because we fail to address the true costs and causes of risk. The banks and insurance companies don't
 10 need to manage environmental risk because taxpayers fund it with FEMA, the FDIC, etc.

Would it help society to have motive to reduce the cost of problems rather than operate in denial? Would it help capital productivity if insurers financed environmental risk reduction enterprise? How would those enterprises be defined?

15 **Part II: Insured Certification Redefines Land Use to Create New Products.**

Process assets transform the state of commons to produce transformation products. Examples of transformation products are smoke, carbon dioxide, lumber, silt, nitrates, food, and views. Some transformation products are sold and others constitute positive or negative externalities; i.e., costs or benefits not accounted within any
 20 transaction. There is nothing inherently positive or negative in an externality or operating asset. One person's asset might well have a positive or negative value depending upon the intended use of another. "Ecosystem assets" refers to natural processes and extractable resources that are indigenous to the property, such as weather, soils, mineral wealth, and habitat for various species. A "process" is composed of that which produces
 25 a usable asset. Soil constituents, water, solar exposure, and atmospheric conditions support the growth of trees, while plate tectonics, crustal subduction, volcanism, and erosion support the presence of mineral deposits. The term, "boundaries" is used generically to denote the edge of anything: a parcel, a forest, or an aquifer, while "lines" refers to legal limits of ownership.

30 This discussion centers upon rural residential development as a set of familiar issues, to which existing law applies. It does not represent advocacy of additional development.

Determining ownership of many ecosystem assets is difficult. Many do not respect traditional property lines because they are mobile, chaotically distributed, or have overlapping boundaries. They are not tradable or valued when the parcel is considered as a single use. Some operate on a minimum scale, too large for a single owner. The land assets people purchase is not pristine habitat; it is the buyer's investment. When the previous owner chose to vacate, it was a choice to discontinue that operation. The potential buyer considers the property with the intent either to continue operations or to convert its use toward a more attractive return. Public claims on the use of private property have induced owners to sell. The public often extends its claims by citing historic "damage" for which they hold the owner accountable. The historical record of the original transaction that induced the damage, therefore demands close examination.

1. The transfer price of a parcel represents the investment value of its assets employed toward the use anticipated by the buyer. The price and assessed value of any parcel reflects its intended use. A farm or tract of timber does not typically include appraisal for residential value and residential buyers do not include appraisal of the value of soil fertility or standing timber. Neither of these uses includes in the appraised value accounting habitat for endangered species, range for large carnivores, rain percolation, or its contribution to the health of downstream flood control and fish habitat. Unless the property is encumbered by specific legal or regulatory action, the buyer is not notified at the time of purchase and the land is only worth the investment value of those assets applicable to the anticipated use. Other assets are not recognized in the purchase price unless they radically effect the intended use. These are unvalued (or in some cases negatively valued) assets that, in this discussion, will be referred to as "external land assets" – so-called because somebody besides the owner derives a cost or benefit from how those processes are managed.

2. Land purchases are legally equivalent to the purchase of the entire balance sheet of its assets including unaccounted externalities not related to the current use. The law assumes that, when a person buys title to a property, they have purchased all the assets and liabilities of that enterprise unless contractually stated otherwise. If a buyer finds gold nuggets or rare antique liquor bottles on the parcel, they belong to the titleholder unless mineral rights have been deeded away or recovery of artifacts is prohibited by law. If there is a hidden toxic dump on the site, or a problem with a road, those belong to the new owner as well. It is up to the owner to settle with sellers

regarding non-disclosure should the problem pre-date the transfer of title.

Suppose that there is a road on a property constructed for removing logs in the 1920s. If the current owner bought the property in 1970, the road was likely to be considered an asset. The buyer may have paid more for that land based upon the economic benefit of roads. It was access for fire control. It was a way to get
5 equipment to the more remote reaches of the property. It was a way to get to a potential home site, should the owner wish to subdivide the property later. It also had value as a hiking trail for scenic access or for hunting and fishing. It retains every one of those potential uses to this day. The road can acquire liabilities after the time of
10 sale because...

3. Democratic claims, against the historic uses of the asset and its potential transformation products, change its market value after transfer of title. Suppose a city that consumes water out of the river, has grown in population. The urban water users assert that all such roads are potential drainage or erosion problems or threats of
15 additional development and that they must be upgraded or removed even if there is no proof of such. That threat of sediment is regarded as a liability belonging to the road owner by consumers who supposedly have a legitimate expectation of a pristine forest draining into a democratized commons: "our river."

Now, these adverse impacts may all be somewhat true. One would think,
20 however, that access for fire control was still important, and that a conflagration would cause more landslides, sediments, and other problems for spawning fish than a few cubic yards of erosion every ten to twenty years. A road certainly makes habitat restoration efforts much more efficient (such as removing weeds and managing controlled burns). On the other hand, roads are a transmission medium for weeds.
25 Does this mean that we get rid of all such roads? Who decides upon which roads to keep, or how they are to be maintained?

These claims are often subjective interpretations of "ecological damage" supposedly visited in the past. It is assumed that the only beneficiary and sole perpetrator to this misdeed was the original landowner. Thus, all future costs to
30 remedy the problem are somehow to be born solely by subsequent landowners when they purchase that resource enterprise. There is no means or opportunity for a transaction to weigh these externalities objectively because,

4. External assets cost or benefit someone other than the owner. Other people,

besides road owners, have opinions that determine the economic worth of the risk of sediment from rural roads, versus pristine water quality at high extractable volume. These people have no immediate use for a road, but do have a collective interest in water quality. Because they don't want to pay to buy and mitigate the road, that
5 mitigation requires a coercing agent. The only effecting agent at the claimants' disposal is government. Civic rule systems are structurally-unsuited for weighing individual cases, especially when designed in service to the interests of either the politically dominant or its own.

The urban party to the external claim upon the road has historically chosen to
10 impose regulatory restrictions upon all private roads without consideration of their individual benefits. The legal and political effort to force mitigation of one road is not much less than to do so for all roads. Failure to comply then constitutes a crime, whether or not an actual problem with any particular road is proven to exist. Accountability to mitigate roads is coerced out of the owners because the state has the
15 power to do so and the democratic majority doesn't want to pay for it because...

5. Retroactive claims against historic land uses often disregard the participation of the beneficiaries of the original transaction. Besides the original owners, there are other participants in the original transaction, who did not pay for the externalities of lumber production, that benefit from the original road construction for
20 tree removal. These people are also the sole beneficiaries of the subsequent retroactive political imposition of "remedy." Let us consider the original transaction upon which this conclusion is based.

The parcel owner, at the time the forest was originally logged, priced the logs in a competitive market that would not pay for any consideration of externalities, such
25 as sedimentation of watersheds. The consumer of that product did not pay for habitat mitigation as part of that product. Much of that lumber, sold long ago, is in use to this day. These houses, located primarily in cities, bring no less a benefit to their current owners than those in new houses. Higher current construction costs are due, in part, to more expensive materials that reflect the mitigation costs of recent timber harvesting
30 standards. The capital gain on the existing homes reflects the replacement cost of the original lumber induced by the current cost of mitigating those original externalities. That capital gain accrues entirely to the urban homeowner of the old house. None of that capital gain accrues to the original producer of the lumber or the current owner of

the enterprise, indeed the opposite. The owner incurs a liability and a significant operating cost. Those original harvest processes were performed to the legal standards of the day as permitted by the agent of the urban public: government. The sole parties benefiting from the regulations are the urban democratic majority and civic
5 bureaucracies who acquire control using the police power of the state.

Political valuation is not only counterproductive to the protected resource. The public either pays too much for grudgingly executed mitigation in the products that it buys or it induces an artificial preference for substitute goods. These are either direct substitutes supplied by a competing producer or product substitutes by a competing
10 good. Substitute goods carry their own externalities, borne by those who suffer them where they are produced. Worse, if the best of landowners are driven out of business, then their land is either converted in use, sold to inferior competitors, or abandoned to civic ownership.

How does one objectively balance the benefits and liabilities of the road? The
15 answer should include its unique ability to transform the state of mobile goods. One has to go through the steps of evaluating the risks and benefits of any road to arrive upon the balance of its total asset and liability accounts, including externalities. These external land assets are not reflected in the market price for land, nor are severally tradable. When these assets extend across property lines, are fragmented, or are
20 mobile, the situation is more complex. Without appropriate definition of boundaries, we are left without bases for transaction contracts. In a very real sense, without property boundaries there is no property. Let's look at the factors below and see if there are some principles that apply toward a new way of defining the problem in such a way that total solutions become simpler.

25 As competition for control of land use becomes more acute, the demand for precise property boundaries becomes more important. The physical attributes of resource assets that confound boundary definition include: mobility across boundaries, combinatorial factors among processes, and discrete versus continuous physical properties. Changes in land use technologies and market demand confound
30 all three.

Constructing a definition for a claim of ownership has had much to do with the perception of permanence, or residence time of an asset within specific boundaries, as does its scarcity. Fluid resources, such as air, are sufficiently mobile and inexpensive that no one has bothered to define "air rights." In many locations throughout the West,

water is relatively a scarce resource. Boundaries and contracts governing water rights are more difficult to define than for dirt because water is a continuous fluid capable of mobility across property lines. Other mobile goods can be regarded similarly. An aesthetically pleasing view of a landscape is an asset that crosses property lines
5 instantly by reflected light (photographic rights to the Monterey Cypress or the Golden Gate Bridge are famous examples).

Assets we commonly regard as "fixed" are in fact mobile as long as one opens the span of time for the movement to be significant. Such changes can happen more rapidly than is commonly supposed. This has been demonstrated in more than one
10 dispute over property lines defined by rivers, where riverbanks can be very suddenly relocated by an earthquake or flood. Perhaps this problem with mobile assets is more about how we define ownership than about how we define boundaries. When highly mobile resources become scarce, the definition of ownership boundaries gravitates toward control of the means by which the asset is transported and distributed and the
15 manner in which its state is transformed. A typical such example is the definition of water rights: both riparian and underground.

In our case of water rights, it is not as important to own the water itself, as it is to be able to control it. It is nearly impossible to stop water from leaving the property entirely; it evaporates, it leaks into the ground, it leaves in animals, or runs downhill.
20 The owner of the water has the right to use an asset for which ownership is defined, such as the earth within a bounded region with which to make a reservoir. That asset collects, stores, or transports the water in usable condition such that it can be extracted for use. What one can control, and what does have value are the physical process assets that change the state of the water, whether by processing, storage, or
25 transportation. The water thus acquires potential value once it is contained, in part, because a claim of ownership is no longer as ambiguous.

There is no actual value in the water until it is used, even if that use is to support ecosystem assets. People may have various opinions about its relative usefulness, depending upon what it solvated, suspended, or cultured, prior to their
30 intended use. Condensed water may fall onto the property as snowmelt and collect a few ions on its way into a creek. It may be ingested by animals, and then expelled onto the ground along with a few amines and salts undesirable to people, but very desirable to plants. After soaking into the ground to be consumed by bacteria and roots, it might be forced through a pump or cross the property line underground. It

might leave the property as vegetables for sale or escape as vapor.

No one cares as much about the water itself as its condition and availability for a specific use. They care about the degree of control they can have and what it will cost to acquire. Thus, the issue of ownership of a mobile asset is about how it is contained and used. How an asset is used is all about the process assets used to control it.

It is the physical properties of an asset that determine the simplest manner by which to define a control boundary. Water is easier to control as ice than as a liquid, or more controllable as liquid than as atmospheric vapor. It is well contained within a cow, but not for long. That all physical materials are dynamic, and that they are transformed in state by process assets, is at least something all resources have in common. If one can then define ownership of a process asset in terms of how it changes the state of a mobile good as it crosses a control boundary one then has a powerful definition for private property that can be applied to a number of vexing problems. The current invention is ideally suited to optimize definition and management of such uses.

It should not be surprising that if control of the use of dynamic goods really is the issue in creating a market in ecosystem management, then control system mathematics might be a useful model to characterize their operating properties. Control System Engineers use a capable range of mathematical tools to describe how signals propagate through a device called transfer functions. The idea is that if you assume a bounded and controlled environment and insert a series of known inputs and measure the outputs, you can eventually learn how that environment will respond to dynamic variations of known inputs. The mathematical description of how the environment modifies that unit input is the transfer function of the system. One then uses the math to describe all inputs as scaled and time-delayed multiples of a basic, unit input. It is not necessary to know everything about the internal workings of the environment to have a useful mathematical model with which to characterize system performance. Chemical engineers use analogous tools to describe processes called characteristic equations. These can be as simple as polynomial approximations of a system derived by statistically designed experiments.

Regardless of the approximation tool, it is paradoxically true that the only way to successfully analyze how an ecosystem asset interacts with its seemingly limitless surroundings is to limit analysis of its inputs and outputs to that which transpires

across a control boundary. By using these descriptive tools, one might then define real property, not so much as a bounded region with internal activity, but as a right to control and manipulate processes within control boundaries through which resources are transported and modified along the way. There are important practical benefits to this technique:

1. The legal description of the boundaries matches the physical attributes of the asset. This directs the legal and financial descriptions of those attributes toward manipulation of characteristics pertinent to their value.

2. There can be no ambiguity about whether civic constraint of a use is a regulatory taking of private property, because all real property is defined as a right to control the use of assets.

3. Consideration of the public concern over a manner of use of such private process assets can be addressed through a free market and a civil risk management system such as Insured Certification.

What if one finds a new use for which there is no previous definition? If it is a good investment then patent and license it. Then purchase contractual rights from property owners. It really makes proprietary process development of means to improve the use of resource assets worth the trouble. Insured Certification calibrates their economic value.

There are minimum economies of scale, necessary for some of these intangible process assets to operate economically that have no interaction with or impact upon other valued uses (orthogonal to the respective transfer functions). How does one deal with process assets that are themselves continuous on a large scale? If the asset control boundary held by a single property owner is too small to be worth an investment there might be an interest in buying or leasing rights to the totality of uses within the asset boundary. One can negotiate fractional ownership or a contract for rent of a land use that can then be exercised upon a regional basis. This is a way to unitize such a product without property owners ceding away all their rights to the use of their land.

Every property has attributes that do not possess market value until they are combined with other goods toward completing an economic use. The total account of resource assets, as applied to these combinations, are unique to each bounded parcel and each prospective use. For example, groundwater has different value for irrigation versus mining. The highest value is found in the most profitable combination of uses

and resources particular to the parcel. Each use of property requires a combination of physical, technological, and market factors. It is intuitively obvious that some parcels are particularly suited for at least one purpose, lacking only investment to develop or compensate for its lesser attributes to complete a profitable composite use. Each
5 property has a different total account of these asset composites and investment requirements, relative to other available parcels. Every selection of a combination of uses is a compromise, especially when some eliminate the possibility of others.

To combine the attributes of a parcel into a functional composite often requires at least some modification of one or more of its attributes. We do needless
10 damage to both habitat and capital when these alterations are necessary or beneficial uses are forgone, simply because of legal boundaries or the cost of paperwork. The degree of ecological compromise can be reduced if we make land assets more easily transactable such that their attributes can be allocated optimally or combined into functional units. To make a particular combination of assets a functional entity thus
15 requires the ability to assign control boundaries of the necessary assets such that they circumscribe or conform to the requirements of the process.

To maximize total value would then entail that those attributes, unnecessary for a particular use, be combined or employed toward their highest valued combination of uses. The obvious means is to move the control boundaries of the
20 constituent assets in order to combine them into their respective composites through purchase of suitable contracts for use of those constituents. Conversely, when unemployed constituents overlap, or lie across traditional property lines, they can bring a return by selling a similar contract by which a composite is completed. As each of these uses is unitized and maximized toward its maximum potential, total land
25 value increases. Even if that use is an undisturbed parcel, under this regimen, it would be that particular parcel's most valued economic use.

Completing a composite use therefore involves several prerequisites:

1. It must be possible to complete the entire set of constituents. A site for a residence, having no adequate route for an access road, would not be so considered.
30 Attributes or uses of other parcels can be purchased in order to complete a composite use. Assets, to be combined as a system, need not be adjacent in order to be a functional unit as long as they are adequately connected through an appropriate transmission medium. Were one to invest in a chain of wetlands to support a migratory bird, one would regard useful proximity to be perhaps the distance of a safe

day's flight through air.

2. The scale of operation should be appropriate to the attributes. A plot of land must be at least a minimum size to be a successful farm or National Park. Scale can be offset by a concentration of value. Somebody would definitely go to the trouble to stake a claim on a one-cubic-meter gold mine if it were comprised of a solid nugget.

3. The technology to take advantage of the use must exist. Without the technology to pump water over mountains, Los Angeles could not exist as it does today. Without pumps, houses would need proximity to riparian water sources. Changes in technology can reconfigure the allocation of assets toward new uses or modifications of existing uses. Here again, Insured Certification, because of its emphasis on processes plays a facilitating role.

Let us return to our development model. The original design of property lines reflected the uses of land as perceived by the original settlers appropriate to the markets and technologies of the time. Soft rock or level soils were once more suitable for building a road and residential footings because they could be easily dug out and graded. Modern equipment has reversed that desire so that houses on ridges or slopes can be more secure in an area subject to earthquakes or landslides. New technology has rendered alluvial bottomland near riparian areas once useful for roads and residences possibly more useful for other purposes. It is insanity to spend hundreds of thousands of dollars shoring up an unstable slope so that a driveway can get to stable rock, simply because of setback requirements from property lines that reflect design considerations based upon the use of picks, shovels, and horses.

Improvements in land surveying technology resulted in a demand for accurately calculated, fixed artificial boundary lines instead of physical landmarks. As the demand for consideration of particular physical features becomes more acute, these nice and precise lines begin to have their own unintended consequences. They sometimes break up usable resource regions into unusable subunits, or cut off access to a critical resource. One should be able to move the lines on the paper more easily in order to adapt appropriately to new land uses, given new technology.

4. The precision and tolerance of a property line should be appropriate to the intended use. The greater the demand for a resource, the more important it is to define the boundaries of ownership with great precision. Not all boundaries defining need the kind of precision tolerances required for urban boundaries. If a walk with a

wireless Global Positioning System (GPS) transceiver was sufficiently accurate for the anticipated use, redrawing boundaries and transferring uses would be less expensive. Software could generate the necessary descriptive maps and translate the coordinates into a legal description. Necessary negotiations could be completed onsite
5 via the Internet. This would allow consideration of details that would eliminate the impacts of accommodating historic boundaries.

There are currently limited means to broker and insure transactions in ecosystem assets because it is obviously preposterous to invest in a complex, expensive contract for a use of something that returns next to nothing. Landowners
10 will not go the effort of adjusting boundaries or selling shares in bounded ecosystem assets until it becomes less difficult and less expensive to do. Complications to property transactions encumber its optimal combination of uses.

There is only very specialized understanding of how one might write contracts in uses of ecosystem processes. Current consideration of such resources is
15 incorporated within contracts and permits controlling other uses with significant economic worth. They are considered only as costs. It might not be so unlikely for an owner to consider each component of land value for its distinct profit potential, once its economic value is measured and transaction costs are minimal.

As complex interactions among ecosystem processes are better understood, it
20 will be simpler to construct standard agreements by which to trade in their use. The cost of redefining boundaries would fall because of economies of the volume of transactions and analysis. Once mathematical models characterize process operation, the agreements to trade in their use can be constructed with software as easily as we do stock market trades. Control of a constituent asset could be marketed through an
25 easement, rent, contract, partnership, or formation of corporate entity. This could be a new market in which the skill sets of title officers and insurers would assist marketing products by calculated degree of risk. The market can exist only if an objective accounting of the economic value of the risk exists.

Government has instituted policies diametrically opposed to open markets in
30 ecosystem assets by virtue of its monopoly to administer democratic claims. Few people recognize the cost of preferential regulations restraining trade at the behest of organized groups of State licensees. First, consider the case of title transfers and real estate.

Current regulatory law, in the County of Santa Cruz, demands that each

residential lot meet all the functional requirements to support a residence before allocating a permit. This is called the "bio-dome" principle. It was proffered as another of those famous ways to "resist development" by attempting to render fewer parcels as appropriate for construction. This "unit-compliance" policy has forced
5 landowners into far more elaborate adaptations to the less ideal circumstances specific to each parcel. These are consequences of zoning laws, building codes, and fixed property boundaries, but they made it far easier for real estate agents to unitize each parcel for sale entirely in terms of its residential potential.

It backfired. Now every one of these compromises has to have its own
10 technical analysis and disclosure at the time of title transfer when it is too late to be telling the buyer. The net impact is to have massive legal title documentation of a non-optimal situation that does little to prevent a problem. The technical points end up lost in a blizzard of details, that are patched up to close the deal and then forgotten until huge amounts of money have been spent to file for a permit. Then the problem
15 rears its ugly head and hangs up the whole project, often after significant physical disturbance. People get sued.

The people who pushed the bio-dome law probably had little idea how inventive homeowners and their contractors would be in devising ways to force their will upon the land; or maybe they did? It was certainly a good deal for contractors,
20 civil engineers, consultants, and trade unions. Sometimes the requirement for a license ends up as an extortionate scam. (It is not exactly a good use of capital to pay \$65/hour for a \$10/hour person to "witness" a grading and compacting operation, in order to make certain that there are no roots in a fill.) Professional license requirements make numerous, easy jobs inaccessible to professionals with cross-
25 functional training, in the name of restraint of trade, professional liability, and barriers to entry. The lack of risk assessment in their employment leads to every one of those professionals covering their personal interests to the exclusion of all else. The bio-dome is a significant barrier to trade in a fluid market of land uses. Use contracts could be traded and combined across property lines instead.

30 When but a single professional interest is involved in a decision, ecological tradeoffs are seldom given the consideration they deserve. If the barriers to trade drop, the total volume of analytical work, to determine which among the available technical options is best, will rise. There is little recognition of the potential to be found in a larger total volume of analysis at lower overall liability, but at least we would end up

with better development. If the contractors operate under the umbrella of insured and certified best practice general contractor who knows when to hire a licensed professional and when it is a waste of money, the concern about professionalism is covered.

5 Turnover and instability of ownership have hidden consequences that are difficult to quantify, but easy to understand and observe. Overlapping land uses and returning profitability to land-ownership operates as a positive feedback loop to improve the quality of land management because it rewards experience. It takes time and dedication to learn about the unique characteristics of any piece of land. People
10 who are more experienced with local ecology are less likely to make mistakes in their choice and manner of uses but, if they are at risk of losing the land, the incentive for long term investment is lost. Instead of selling land outright, use contracts could transfer at higher velocity without such drastic impacts as sales. Tradable assets foster interdependence and socialize people. They bind neighbors together with motives to
15 cooperate to solve local ecological problems. They reduce the need for redundant capital, site visits by heavy equipment, or government surveillance. They make people more cautious about the character of their neighbors, thus making impeccable integrity as a neighbor, a personal and group asset.

Economic interdependence, generated through free enterprise in economic
20 land uses, stabilizes communities. It slows the spread of development and reduces environmental impact because collective interests bear upon individual transactions. Interdependence complicates the sale of entire bundles of these overlapping investments as real estate transactions, but need not do so when the sales are in but a single use. A market in freely exchangeable use-boundaries would facilitate suburban
25 in-fill redevelopment, by unlocking sites theretofore unsuitable. Isn't that what the government planners say that they want?

Redrawing boundaries for land uses can eliminate many causes of water pollution such as roads, septic drain fields, and overdrawn water rights. By trading in uses, small or marginal sites could be more easily unlocked from existing constraints.
30 Property lines might be redrawn to take advantage of changes in technology. A property owner could buy an unstable alluvial parcel as nothing more than a commercial drain field to accommodate a rather smelly mobile asset with negative value once an acceptable hose was available. Siting would then best suit the land and reduce the propensity to sprawl. A site with particularly hard rock could have asset

value as a location to dissipate the energy from winter runoff. A site with available fill dirt (or for that matter a site that could accept it to mitigate an old road) eliminates mining and transporting it. One could then correct a problem before catastrophic failure. Whether it is visual impact, or runoff from a horse corral, trading such uses
5 among landowners employs each property in a manner best suited to its specific attributes with lower total impact. A market can instantly balance all the considerations, but only if all such they have a market price.

The key to all of this flexibility is the recognition of real property as a bounded right to control process assets that transform the state of commons. Once one
10 recognizes that it doesn't matter if one owns the dirt itself, but only what can be done with processes within control boundaries, what one then learns is how to define workable boundaries for newly identified uses and conclude the appropriate contracts. In the case of a marketed drain field right, one uses a land process asset to remove and process nutrients that are considered water contaminants elsewhere, and
15 simultaneously invests in harmonious uses that improve the function at a larger profit. Land use contracts might then be a more competitive market. Those most qualified to maximize the profit of such uses as justify a reduced cost of risk at a competitive price, would attract the capital to commit more funds to resource investment operations, much as they do in other markets.

20 Without a way to trust the motives of the owner, these markets are unlikely; meanwhile, owners won't trade or invest in a use over which they have little control. A civil accountability and risk management system, such as Insured Certification, has the competitive incentive to address that balance directly and efficiently. The system collects the data, necessary to initiate the mechanics to account the value of ecosystem
25 resources that are the foundation of such markets.

If the public continues to demand a specific use of private property such as preservation, then they should contract for the necessary management services from the landowner at full market value. Anything less is a taking. Why should they go looking to government when a proven resource manager is available with incentive to
30 provide the best possible product at minimal cost? Doesn't the public want to pay for a healthy environment? If not, where will the money come from to care for the land? Taxes? Who will do the work? Wouldn't it be more expensive if operated by a government agency? What if the work isn't done and the land degrades. Who pays for that? What would be the lost opportunity of taxes on profitable operations? Does

bureaucracy have any motive to deliver a self-sustaining system? Can we afford that?

Insured Certification to a process standard, and the tradable processes that result, assure diversity in property management strategies to minimize pooled risk and improve the limits of quality. Private contractors, insured ecosystem assets, and pricing risk into every product, directs people toward the blessings of self-government and weighs ecological risks scientifically and objectively on an interactive basis.

Part III: Using the Method to Market New Products.

The following section details the integration of insured certification, risk-based pricing, and trade in bounded rights of use.

Under current law, no landowner can freely market all the products of the land. As things are now, one does not own its oxygen-producing and water collection potential; one does not own the value a pond has as a stopover for migratory birds. Now, government wants to charge the land-owner penalties for deleterious effects to these assets, even when largely caused by others who are immune for political reasons or converted their land before anybody cared. Under current environmental law, these ecosystem assets have become liabilities. No wonder they are undervalued.

The landowners are told that those butterflies that just moved in are rare because somebody else converted their land. If they harm the weeds, pre-ferred by those butterflies, the fine is twenty-five grand, or maybe a jail sentence. The remaining landowners, still paying taxes on the property, just wish the weeds would die so that the butterflies would leave. If they do leave, that landowner will pave it before something like that happens again. It IS a tragedy.

This type of taking is an evil because it removes value from ecosystems and eliminates the incentive to invest in their health. What the "takers" argue is that the right to control the assets found on a parcel do not rightfully belong to the owner because a particular use is valued beyond the bounds of the property. Curiously, they find little difficulty in claiming that the owners are responsible for all the liabilities, under the same logic. Such political claims are about stuff, who controls it, and at what cost.

These claims were extended because too many people ignored their transformation products and forced their costs upon others. There has been at least a short-term market advantage in doing so, among other reasons, because those who

first cleared the land of its natural resources have had less need to worry about such things as endangered species or riparian resources.

Insured Certification to a process standard can return some of that market advantage back to the resource landowner who collects accounted data on the cost of risks associated with operating validated processes. Seeking new ways to reduce or offset risks creates new products in resource asset management. Rendering asset ownership across property lines more tradable has been shown to have the potential to reduce environmental impact. By themselves, these activities would be better than what we are doing now. When they are combined, however, they can be applied to ecosystem assets that transform the state of commons, extending beyond or moving across property lines on a global scale. Over the years, wonderful things can begin to happen.

Where the concept of fungible resource assets as processed really gains power and applicability to solving major environmental problems is when applied to the "tragedy of the commons." The best-practice system design sets people free from dealing with needless bureaucracy. They are motivated by that dispensation, its research requirement, and the potential for profit opportunity to use their time and money to study the land and accumulate the knowledge of how its components work as elements of larger systems.

The landowner accumulates data, not only on those products that now have tangible resource value (such as timber), but also on the other physical and biotic attributes of the property. As these are measured over time, other processes particular to that location become apparent. That recognition leads to a process of discourse among landowners with similar assets. Discussion economizes the language of resource function into higher order models. It identifies those processes or behaviors that are causes of expensive risk. Such communications lead to negotiations that weigh the relative value of these processes, and how they might be combined into functional economic units that offset ecological risks.

Second, the owners then combine their data to identify and consolidate operations of contiguous regional systems or non-contiguous systems. In a search for scientific truth, the motive for collecting and analyzing data is what transforms their application to technology. Rarely are the properties under study fully understood, unless free exchange is conducted in an environment that supports a profit opportunity. People, motivated by common interests, articulate those opportunities. A

language of discourse appears. Ideas are realized, their potential excites, and articulations are clarified. Wishful thinking is challenged. Justifications for experiments are sold and investment requirements are calculated and allocated. Results are measured and, if successful, there is reinvestment and replication on a
5 larger scale. Successful investors then look to successful inventors for new opportunities. Motivation is what transforms empty compliance into research. It is a natural process of being human. The only thing in the way is the all-too-human desire to control the use and take that value, without paying for it.

Civic agency exercises power through collective assent, for which civil
10 approval is not a requirement. A civic agent is the only person armed with the police power of the state, the power to violate private property rights. Civic agency can discount the cost of land acquisition, in the interest of enlisting democratic support, by which to acquire control of the use. Once the value of that good is discounted, there is no longer any investment value in its development, nor is the process readily
15 reversible. Once control of the factors of production is enforced by sufficient police power, there is no longer any value to the collective claim.

Stated more elegantly: You can't trade what you don't own. You don't own what you can't use. Then what is the use in taking care of it? So nobody pays attention and there isn't any money to do anything about it, anyway. Such is the
20 devolution to a socialized commons. The alienation of the individual from the collective interest, with the freedom to control an asset as property, demands the consideration of free trade in order to alter a choice of how to employ that asset. Without identified and accounted alternative investments, with predictable returns and controllable risks, there are no bases for an investor to weigh options of land use.

25 It matters not whether property rights originate by divine endowment or universal public agreement on inviolable Constitutional law. The mechanics of free trade in ecosystem assets demand unyielding civic respect for individual property rights as unalienable. The question remains, how do we rekindle such public understanding and render individual choices reflective of interdependent
30 considerations?

Communication within a structured context of risk management opportunity is what selects and organizes products for free exchange. Recognition of the economic value of ecosystem resources starts a process of individual outreach. Perhaps there are marketable contracts in fuel management or absorbing concentrated drainage flows

near a residence on an adjoining property. Data-sharing and contract negotiation is an ongoing process that leads to the combination of data from one property with others similarly affected. This process helps define how we communicate about ecosystem processes functions.

5 Discussion of such exchanges builds that common language into higher-level understandings of more macroscopic functions. Their heterogeneous origins demand concatenations that themselves induce redefinition and refinement of the data collection and discussion format. It is a positive feedback loop that simplifies means of understanding interactive processes with multilevel variables and combinatorial
10 effects.

 Data, integrated from heterogeneous sources, facilitate discovery of systemic operations on a scale and with a depth, unachievable when managed from the top down, no matter how sophisticated the analytical model. It is far easier to identify systemic function from base data and randomized trials, than it is to posit
15 oversimplified cases for a theoretical computer model, and then query reality for corrections to the lack of fit. Landowners have the benefit of local knowledge with which to identify a spurious or locally inappropriate theory. Trust, as earned by a validated record of excellence, reduces transaction overhead sufficiently to allow the flexibility to experiment with new models of interactivity. Social verification among
20 individuals with interdependent interests can both prevent and limit the scope of needless errors.

 Sometimes data bring bad news. An outwardly directed process, with structural provision to profit by risk reduction, will seek to correct them early and share information derived from corrective action. The process necessarily leads to
25 assessment of how plans or problems affect others or how assistance might be enlisted. That motive is founded upon the knowledge that in problems are found opportunities, particularly when the actors are co-invested. There is then reason to trade in economic goods that mitigate the effects.

 Does forming a dedicated corporation sound like too much of a hassle for
30 what appears to be a small asset such as a migratory butterfly landing? That reaction you had to the implausibility of the concept is precisely why the system needs to be more competitive. It seems ridiculous only because we have little idea how much the existing system really costs or how big the scope of butterfly management might be. It is a hassle to do only because of current costs of transaction and data processing, in

large part imposed by the legal system and government. (Title insurance companies, contract attorneys, Security and Exchange Commission, Internal Revenue Service, County Recorders, State Board of Equalization...) Many transactional externalities exist merely to document evidence for potential lawsuit or to enrich the gatekeepers.

- 5 The paperwork in resource enterprise incorporation and operations could be completely automated. The corporations currently processing and insuring these transactions could instead be competing to develop efficient ways to assure low-cost transactions in such management contracts, and marketing management tools to reduce those costs. With the higher transaction volume in use contracts resulting in
10 lower transaction overhead, an investment in butterflies might be justified.

A corporate entity requires cash flow. Historic sources include timber sales and grazing leases. Other uses were combined under those operations to render the total revenue adequate against the cost of management. These simpler forms differentiate as the mechanics of their operation are clarified, the sophistication of
15 targeted marketing develops, and the cost of overhead falls. Early and more traditional products have included recreational access from private roads and trails, hunting, bird watching, fishing, or tuition from educational programs. These exist in scattered locations, but we are still not talking about much money, in many cases because of price suppression by the public park monopoly. Economies of scale will reduce
20 transaction cost but the main reduction in overhead will be that of regulatory cost.

Individual sellers would naturally differentiate their unique products with respect to local conditions. Some locations might be more appropriate to high volume timber production, selling open space access, or offering contracts for forest and fuels management according to the preferences of nearby homeowners or watershed
25 management companies. The cash flow from many of these goods might be small. Some uses might not be marketable at all unless multiple owners participate, such as chemical management in a watershed or a range for large predators. Other products might not exist until a network can form over huge distances such as migration stops on a flyway. Such enterprises could extend across whole regions, eventually
30 encompassing global markets. Consider that a network of wetlands on a flyway could well be considered to be such a multinational product, where the birds constitute a mobile asset. A wetland in a developed area might then be quite valuable because, without it, the whole network is badly degraded.

New products will emerge as the legal instruments to trade in use contracts are

automated. These can be leases for undeveloped space and unbroken views; charges for rainwater percolation, collection, and transport; maintenance of habitat for pest predator insects for development of Integrated Pest Management techniques; safe retention of minimal populations of pests for test culling of resistive populations and
5 operation of interactive trials... The market can operate under extremely complex requirements, especially when these enterprises are combined and overlaid across multiple regions.

In some cases, the value of these enterprises would rise with their proximity to developed land. People value open space more highly in an urban setting, than they do
10 in a rural setting. (Think of the loss in property value to San Francisco if they paved over Golden Gate Park.) This represents an economic force to counterbalance sprawl. Farms could market some of these "open space" products as an additional source of income to remain closer to urban centers. The purchase of shares in these rights is cheaper than buying the land outright and it retains a source of truly fresh food nearer
15 to the customer. (The value of that product might rise once freshness is recognized as possibly having far more health benefit than does reducing pesticide content. This will be discussed in the section on pesticides and natural plant toxins in Part IV.) The same lands can also be used for hands-on education, or rental space for vegetable gardening, as is seen in much of Holland.

20 Wetlands manage transitions to estuaries where many of our ocean species breed. Are they important? What valued assets would we have to defer were we not capable of preserving the counts of wetlands species by investing in more detailed management on those that remain?

A market can integrate the risks and benefits of competing approaches in order
25 to expand the range of potential trials without forcing them toward extremes. Sharing in pooled risk among different approaches balances the temptation to get too heavy-handed. Where a highly extractive approach might yield a great deal more money from operations, the mitigation and insurance costs might tend to offset that approach. A more gradual extraction method might yield less directly, but could alternatively
30 provide a return by offsetting the more aggressive experiments of others. The market, in that respect, is self-correcting, as long as the costs of risk can be assessed against the conduct of operations. Without a way to trust that these costs and benefits are honestly measured and assessed, none of it can happen.

Discounted futures can disperse the harvests according to a time-managed plan

by location and according to initial conditions, relative productivity, and superposition of other considerations by site. A civic authority simply can't do that without being subject to the temptations of corruption through the legal power to apply non-uniform treatment. Without financial consideration of what land assets provide, we are back to political fights with the resulting mandated neglect, sclerotic information processing and decision-making, and confiscation of the wealth in support of paperwork that the land needs for its own. Every time someone crosses a property line for the purpose of a walk, it is in a very real sense a theft of uncompensated pleasure absconded from the land they came to see.

What has been happening is that the urban public has been taking many of these things for granted and for free. If such uses are truly "valuable," then the fact that they are rendered more tradable through defense of property rights resolves the conflict of competing claims by setting an equitable price for the use. Perhaps the greatest profit opportunities for landowners lie in the discovery of that mechanism. One could own stock in that collectively-held asset. One could sell shares in land use enterprises and make claims or derive benefit as shareholders or customers. Stock ownership is a mechanism for integrating an external public claim with internal private ownership that is truly voluntary and has a basis in cooperation and common interest. This is a compelling argument for the divestiture of civic holdings into the private sector and going through the effort to learn how to weigh the value of ecosystem resources objectively.

In review, each property owner would study the land and analyze its interaction with the surroundings, as part of the certification process. One can then recognize the net worth of its constituents. Not all the assets and liabilities to be found on a single parcel are entirely contained within its boundaries when considered as an operational enterprise. There are many ecological processes that can only be considered as such, when they are combined with other proximate parcels, for a regional process asset to exist. The capital value might not be much for these factors individually, but they could be quite important when considered in total. Pricing is derived from both the divorced opportunities associated with extortive preservation and the cost of habitat restoration and investments offsetting impacts elsewhere.

In any assessment of market potential, the problems and threats to the health of the land become more obvious and weigh against its total capital value. Market systems have the capability, for example, to determine the capital impact of

infestations of exotic species. (It doesn't do much good to clear your land of thistles if the wind blows the seed back over the fence.) At least under insured certification, there would be a measure of the economic loss associated with controlling pest plants on wild lands that should properly affect the purchase price and known operating costs. In fact, there is a very good case that mismanagement of what have been historic responsibilities of government, to protect the nation from imported infestations, should be considered grounds for legal remedy for inverse condemnation.

Recording the cost of exotic species control is a way to price the risk of pest introduction. Such information should be worth money to those responsible for pest transport and introduction and might best be derived in cooperation among landowners at both the point of origin and the site of infestation. The cost of insuring transportation companies at risk of introducing pest vectors (such as truckers, grading contractors, and shippers) could be thereby derived and focused upon vector transmission mechanics. Buyers would then be paying the true price of imported goods. Shipping companies or construction contractors could then justify development of control processes by which to pass appropriate boundaries without the extensive inspection and/or quarantine we should otherwise be demanding from governments. If we are going to have a global transportation economy, we must learn how to account costs of infestation objectively and assure that they are correctly borne by transaction participants. If we do not, the consequences can be horrifying, irreversible, and either tremendously expensive to manage or no big deal, depending upon dose, speed, and species. Think of what has been expended on fire ants, or kudzu and the consequences if we fail to stop them. Which is cheaper, prevention or negligence and to what degree of either?

Sometimes, although the problems can be overwhelming and something that rightly should alter net worth, the net discount on a parcel could serve as an opening to those with the skills and perspective to see those problems as opportunities. What is wrong with that? Wouldn't it be a wonderful change for our society to be thinking about new ways to improve ecosystem health and make a buck solving problems, rather than for young people to be so absorbed with failings that they are talking suicide? As it is, the only existing alternative is to a fight with a foe possessing virtually unlimited resources and wait until they remember that they own it. Once they do, you will have a long wait before you see a carefully tailored and fully funded plan for the property, with no guarantees.

What has it cost us to save the California Condor? This is a case where a hugely expensive, multi-decade preservation program had failed completely before a controversial captive-breeding program was begun. How many dollars were lost in resource and land use value during the preservation? How much was spent in breeding studies, behavior analyses, incubation, training, release monitoring, and then... what are the fines going to be for the homeowners who have the insensitivity to allow the condors to steal the nachos off the back deck? All that preservation with nearly total failure and the birds apparently enjoy the shelter of suburban housing developments. Would it have been cheaper and more successful to have a few houses funding a heterogeneous approach to increasing condor populations? Did we really have to preserve their habitat or would suburban condor overpopulation have driven young birds with better genetic diversity back into the wild? Is there a benefit to having semi-domesticated transitional, suburban condor population reservoirs? Would there be people on the margins of the wild areas prepared to make a buck assuring their success? Do we really know? Is the information, of how much time and effort that went into that restoration and reintroduction, valuable as an estimate of the risk associated with the loss of other species?

None of these countervailing questions would come into play with a risk-based pricing system. Jealous landowners would have already invested in a critical range junction at Gorman Pass (in Southern California) for its value as ideal condor habitat. They would demand too high a price for the land for Enron to buy, compared to other locations with steady winds. Under the current system (sorry), Enron had to find out the hard way after years of site exploration and negotiations. A lawsuit stated that their tax-subsidized wind generators threatened to chew more condors into little bits. Under Insured Certification, there would have been no lawsuit, no bad PR, no political hassle, and no wasted energy on the part of Enron. The benefits of a good management system are found, not in how they solve problems, but in how effortlessly they are prevented.

Once the attributes of a parcel are identified and the individual degree of contributions to total utility evaluated, local assets can be rendered tradable, in larger-scale systems. Does that beat Sustainable Development, where the powers-that-be demand all that in-fill that would drive up urban pricing to the point where an economically viable wetland or farm was impossible? Is there a way for a central

planning agency to weigh those decisions or does it just get political? Wouldn't it be preferable to economically value the marshland of San Francisco Bay so highly that it would have been too expensive to develop? Ask yourself: Who are the real forces behind the rural takings? Greenbelts and other constraints upon "urban sprawl" are
5 advocated by investors who wish to inflate the asset value of their portfolios. Manipulating supply, by location, inflates the market price of select assets.

Why is it that large timber corporations do most of the damage, but each successive generation of regulations advanced by those same NGOs do more harm to small landowners who supposedly weren't the problem? The big guys and the
10 activists even admit it in public hearings! It is the same story. To the dominant corporation, environmental rules are an opportunity to flex the muscle of economies of scale. It is high time for landowners to assume the moral high ground. It is justified. The temptation to corruption makes government a lousy steward of the land.

Let us extend this idea to show how powerful it really is. Let us consider that
15 great human institution, the family farm, and the sense of visceral loss and injustice we all feel at the plight of families, who have loved and cared for land for countless generations, destroyed by our cravings for subsidized food.

What corporations do well is take advantage of economies of scale to make one thing incredibly efficiently. What we need out of resource land management is
20 more than one thing on a frighteningly detailed, site-specific basis. What we feel, in our loss of family farms and ranches when they go out of business, is the disappearance of all the implicit goods they provide. The tragic thing is that those are the very goods for which we never pay! The more intangibles we need from them, the more we regulate their lives, the more likely they are to go out of business when we
25 punish them for not having satisfied our desires. The answer is not price supports or subsidies; the answer is to return to farmers all the assets that come of their land, and allow them to market the range of goods their land is best suited to provide.

Cities use groundwater and farms collect it. How they manage pests affects the water, but we just tell them to take a yield hit to protect it for drinking purposes by
30 banning pesticides rather than truly minimizing the balance of risks. Birds need watering holes and a network of farms can provide food, and shelter. Major river valleys require flood plains that farms can manage, while improving their soils, managing flows of nutrients, soil minerals, and silt transport for estuarine deposition. Riverine fisheries require nutrients and insects; farms could allot the riverfront to

manage that, but what do you pay them for a healthy river? Do we get one by stopping everybody from using their land, taking a poorly compensated fraction of it out of production and calling in the Corps of Engineers to first do the flood control and then do the restoration project to undo it? When faced with managing all these details among the range of goods land provides, the attention to detail and multigenerational experience that the family farm is in a unique position to have a competitive advantage in a diverse array of resource-based risk management markets.

Imagine that Monsanto is under fire for their genetically modified corn borer-resistant Bt Corn product that is supposedly threatening Monarch butterflies (there is good evidence that it does not, but for the purposes of illustration, it is useful to so suppose). Let's say that this special Genetically Modified (GM) corn is also resistant to RoundUp® (a broad-spectrum herbicide). Nobody wants the GM DNA to escape and cross-pollinate the RoundUp resistance with weeds. Monsanto responded with a gene that prevents the seed from ever cross breeding with anything, because it is sterile. There is concern that, because of its productivity advantages, all feed corn would be sole-sourced, sterile seed from Monsanto factories. People are legitimately afraid of corporate extortion or a failure of a year's worth of corn production resulting in a modest public concern called "famine." Meanwhile, the GM manufacturers, after having spent billions in research dollars, face expensive political resistance to the introduction of products that could end global hunger.

Let's say that through the research process of best practice, you (a clever family farmer) discover that you can plant cornfields with some viable, non-Bt, seed corn and a fraction of milkweed. These crops could serve as a double risk offset for those who use the improved productivity that genetically altered seed provides. First, the standard corn serves as a store of viable seed. It adsorbs the multigenerational effects of sterile pollen and might even be worked into a crop rotation. Second, the milkweed is a haven for butterflies that might otherwise be killed by the drift of Bt corn pollen. You, a clever investor, quick like a bunny find some co-conspirators to form a corporation to serve as a migratory chain of rotating milkweed fields for butterflies. Then call Monsanto, and sell them the potential for a regulatory dispensation. They can then sell a product that grows more corn on fewer acres of poorer land using less water and the users would pay for an offset on an established migratory path for those, otherwise-would-be-endangered Monarchs, with perhaps some restored prairie in with the deal. Would it work? How big must these offset

buffers be? How many would be necessary for a migratory habitat? Do they need to be contiguous? Is Bt, RoundUp Ready, Terminator Corn worth it? Perhaps Monsanto would like to know. What would they pay to know?

5 The Environment IS about the interface between natural systems and human economy. Best that we understand them both. Maybe more people should be learning how to make the best of both.

Motive and Means Meet Opportunity. What is needed, is a system that is more suited to help people find personal benefit in an increasingly sound form of ecosystem asset management. Upon the appearance of such a competitor, one would
10 expect beneficiaries of the existing system and try to scuttle the whole concept. Let's look at the underlying motivational structures and how they might be redirected. Maybe these people could find more satisfying and productive work that can more effectively fulfill the intent of their individual career choices.

The structural requirement, for education and research of the proposed process
15 standard, reclaims university research into a cooperative effort with private industry. It addresses one of the great evils of our educational system: the degree to which students and academics are isolated from working society. Students often select fields of study upon the basis of emotional appeal. Then, after using them as cheap grad student labor, we dump them into the world to "make it" without a clue as to how, and
20 desperate to recoup their investment. The higher the degree, the bigger the loans, the later the start, the more desperate the need to recoup that investment.

The research requirements of Insured Certification and classroom participation of experienced landowners in continuing education will foster more productive relationships among landowners and the academic community to solve real problems.
25 It might help return public universities to the public that pays their bills. Internship would help students meet people who have been working in resource enterprise for years, before they select a thesis topic. Students make better career choices if they get a preview of what the work is like. Few understand the alternative of bureaucratic indenture.

30 There is enormous investment in the current system. If this invention is adopted, the bureaucracy will demand consideration of its security. Universities and NGOs, living off both public and private grants, will cry foul. Insured Certification will threaten their source of security, by turning grants into venture capital

investments. Plutocrats owning massive "charitable" foundations might learn that a world rationalized under the intelligence of an elite is a world limited to the intelligence of a few, and that there are better ways to make money. Resource landowners might consider it worth the cost and inconvenience of continuing
5 education to learn new ways of making a buck on their land. The public will have to stop asking government to control private property without the willingness to pay a fair price for the use. It is unconstitutional and immoral to do otherwise, not to mention ecologically destructive.

How then are we to break the loop? That is where this invention offers hope. It
10 is a dual system. It is proven that there is a fraction of any industry, interest group, or government that will abuse laws as a means of acquiring wealth. It is the proposed that the current regulatory system should be focused for the exclusive benefit of persons with no intention of adopting resource enterprise management to the standards of Insured Certification.

15 If Insured Certification proves superior to the existing system, those who had no reason to push the limits of best practice, still enamored with winning the cat-and-mouse game with regulators, will have a choice. They can change their ways or go out of business. With fewer victims left to regulate, what will the regulators do? They will slowly be drawn into more productive work. The private management job market will
20 need people with such expertise. What they discover will engender new products and services. We can give these people a place to go with their intent to do good where they can actually realize it in verified terms. We must give them a basis to drop their reliance upon conformation and civic "job-security." It will take massive amounts of retraining, but in that respect, a profit (or loss) can work wonders. So too, can the
25 exercise of individual freedom.

The conversion of our existing regulatory system is an enormous undertaking. However, the goal of any civil environmental management system should be to integrate economic externalities into conscious selections and then use the market to reduce their cost. The returns are thus greatest where the unexpected is being looked
30 for, rather than avoided. There may be some costs, which we may not know how to pay because they are immeasurable to sufficient accuracy by current technology. Though that might seem problematic with the proposed system, that is how things are now. Capitalists, ecologists, and property rights advocates should observe such political resistance, look for its source, see what is at stake, and seek the carrot of

opportunity for all concerned. These are business investments, job opportunities, and returns on intellectual property developed from identifying and reducing ecological risk.

Examples of Application of the Invention

5 **Management of Timber Harvesting and Fuel Reduction.**

The West Coast of North America has a climate conducive to vegetative growth. Winters are rainy and the summers are long and dry. It is a combination that insures the potential for periodic fires. We know that historically some fires were humanly set, although perhaps we may never know how often. Frequent fires reduce
10 average vegetative cover while leaving sufficient cover for escaping animals. They trim low branches, provide nutrients, and scarify various seeds for germination. Frequent broadcast burning is a process to which coastal ecology has become accustomed. Humans have perhaps ignorantly interrupted frequent fires because of the threat they pose to structures.

15 The fuel has accumulated for fifty years. It is a situation that is now completely out of control because of competing political demands. Fuel management in California is a classic illustration of why a free market in risk management is an absolute necessity for both people and nature. Market distortions due to civic regulation have created a whole range of unacceptable risks.

20 In California, the minimum clearance, between combustibles and an insured structure in a rural area, is 30 feet. Assume a typical neighborhood in a transitional forest region, typical in Santa Cruz County, CA. Most of these houses use electricity to pressurize their water. In a fire, the power is the first thing to go. Many have embrittled PVC or polyethylene water pipes on top of the ground. Many stand on 4X4
25 wooden stilts with wooden lath skirts and are sheathed with redwood shingles over tarpaper, with inadequate roofing and tree droppings in the rain gutters. The trees are huge, often lean, and have heavy branches overhanging the houses. The slopes are so steep and the roads are so narrow that some cannot accommodate a fire truck at all.

30 The price of residential insurance coverage is determined by a rating of the roof material, the age of the building, and how far the house is from the nearest fire station. Think about the above. Should all houses have the same fire control

specifications and pay the same insurance, regardless of the external circumstances? If the house meets the 30-foot minimum then, if it burns, the insurers have to pay and pass on the cost to the entire state? Does that make sense? Insurance is a heavily regulated market.

5 Most of the urban professionals who inhabit rural forests think that a forest choked with brush and scraggly trees is "natural." Their faith in forest preservation is unchallenged by the tragic personal experience of a firestorm. Many share a cultural history of activism against environmental abuse. Their representatives feed off that angst and are now forcing passage of regulations that may eliminate the very forestry
10 practices that can reduce and control the fuel. Because of the restrictions on logging, there are also fewer people with the opportunity, capital, and trained personnel to fight these fires safely.

 The public has also demanded rules protecting a socialized commons: "clean air." A rule system can only regulate human sources of atmospheric pollutants.
15 "Natural" air isn't clean. When we have controlled burns with planned ignitions, they cause "air pollution." If it is a wildfire, the media call it "smoke." Regulating prescribed fire into oblivion may protect CDF and the California Air Resources Board (CARB) from accountability, but it gives us a system that fails its purpose. It has already destroyed the historic fire balance of the forest and has elevated the risk of
20 fatal conflagration to inevitable.

 The firefighters don't dare let one get going, but there is no doubt of an eventual day of reckoning. If the conditions are right, if the wind is blowing hard enough, if the relative humidity is low, if it's hot, and if the ignition point is remote, they won't be able to stop it. Thousands of lives are at risk.

25 Environmental activists think they have a better idea of how to manage the inevitable catastrophic fire. Call it "inevitable" and let it burn. It is a policy that has not been subjected to serious scrutiny. When we have conflagrations, there is a real possibility that recovery to pre-suppression condition will be impossible. This is largely because of the threat of exotic weeds and the loss of indigenous species. One
30 can do irreversible harm to local native species by restoring area with substitutes. Sometimes native plants are very tricky to propagate, especially by seed. Animal collection is even more problematic because there are issues of behavior modification. "Let it burn" does not work. To restore native species after a fire requires both planning and limited scope.

Would government agencies and environmental activists destroy forest ecosystems over the entire coastal region, put thousands of lives at risk, and waste billions in capital the name of protecting urban air quality and a social preference for dense, shady forests? Yes. That is what political control of civic regulation can do.

5 The obvious question regarding this proposal is: "Where will we get the MONEY, time, individual energy, and expertise to fix a problem like this?" We are spending the money now. An insurance policy on a \$300,000 structure with a \$2,000 deductible costs around \$900 per year. This calculates to a replacement payback period less a return to the stockholders (assuming no inflation), of perhaps as little
10 as... 75 years without a loss? One might conclude that it is unlikely that the true cost of risk plus a reasonable profit is reflected by insurance premiums. When considering the impact of fire settlements upon future insurance rates statewide it is obvious that one can play that game only so many times. The Oakland Fire of 1991 cost \$1.7 billion.

15 If one looks at residential insurance as a risk management business instead of regulated bank protection, then we are obviously not managing fuel effectively because insurance is not priced according to risk. Were one to consider the total economic cost of a firestorm, including the ecological costs, such forests are an astronomical risk.

20 Most suburban homes in Santa Cruz County are on smaller parcels adjacent to larger forest tracts. The residents are demanding that the County provide them with laws that maintain the forest on someone else's land to their liking. What they are demanding is for the rest of the State to bear the cost of an unacceptable risk and subsidize thereby their capital gain in residential real estate while the policy does
25 more harm than good.

 The real estate industry would find higher property value in a gardened appearance to the forest over and above what they find so attractive now. Given the accruing fuel load, existing conditions won't last forever. Yet their average homebuyer wants to ban logging forever, effectively taking that use from its owners
30 for one that they prefer. Why should some landowners have to cut more trees to pay for permission to do it, while other forests are choking to death and facing eventual annihilation? Politicians have found suburban environmentalist support to be a direct line to higher office. If however they get saddled with a lawsuit for taking the forest

the voters will be stuck with a large tax bill or fewer services. If the whole thing burns it won't look good for their future. Would they prefer a popular solution to a longstanding problem?

There is an obvious opportunity in the rural suburban forest for a free market
5 in fuel management. If the homeowner really wants to live in an old growth forest, then perhaps they would purchase a management plan from the landowner that will deliver upon that goal and reduce the risk that it won't ever happen. Perhaps that risk-reduction business might finance some of the work?

This plan can deliver a forest that local residents would find aesthetically
10 pleasing, provide a legitimate income to the forest landowner, and safely reduce the fuel load around many of these homes. It would restore a more natural balance of flora and perhaps fire. It invests capital in forest health and can differentiate to local circumstance. It respects individual tastes, and pools risk to temper radical ideas. It might lead to organized, neighborhood-based forest management and habitat
15 restoration activities.

Were insurance rates reflective of reality there would be incentive for homeowners to thin for an effective distance around structures. It might seem that the preference of the insurer would be bare dirt, but it isn't that simple. There are other risks involved, for example: landslides, falling trees, and floods. Roots hold hillsides
20 together. Vegetative cover reduces droplet impingement erosion and adsorbs a fraction of the runoff. Trees protect aesthetic property value but they might need pruning. Drainage design is an art form. Who is best qualified to make that call, among all these competing ecological needs? Foresters and timber operators are.

The insurance industry could retain foresters specializing in fire ecology and
25 vegetation management to assess the home for its balance of risks as sets the price of coverage. The policy price can be scaled according to the risk score. Given liability for false assessment as balanced against competitive need for sales there would be no incentive for extortion.

The homeowners could then hire the work or perform it themselves under
30 direction and training from a forester. Properties under suburban forest hazard management would then qualify for an insurance pricing scheme based upon the selected landscaping product (even if the product is "no cut"). It could be a range of products, from a mixed parkland forest of majestic oaks and herbaceous groundcovers, to a plan delivering something similar to an old growth redwood stand.

There could be a lot in between. There could be various prices for the degree of attention to detail, proximity to the house, value of the stand, and degree of risk. With Insured Certification, these plans could recover some of the cost by selling logs without a permit. Wouldn't it be preferable that the money went into restoring the land, rather than rebuilding after a holocaust?

Now, what happens if some of the land that must be thinned in order to qualify for the insurance benefit is owned by an adjacent timberland owner? This is where the market in land use contracts comes into the equation illustrating how the present invention induces creation of new products in habitat management.

The forest landowner could sell a contract for the style of forestry the homeowner prefers. The difference in present value, between the timber resource when managed for maximum capital gain and that preferred by the homeowner would figure into the price. It would cost even less if integrated into a larger harvest plan as a sector operation.

The forest landowner or management contractor would collect and integrate scientific data, to be applied to a plan of hazard reduction, mitigation of exotic species, propagation of local natives, or preparation for a controlled burn. The coordination of specialties, required to complete the work under a fiduciary, provides the means to balance competing interests. That management market creates an incentive to get the work done at low cost. Insured accountability provides reason not to take too many risks.

The thinning work can be done and surplus logs sold for renewable fuels, pulp, or lumber, thus offsetting part of the cost. The insurance policy price increase can be used to finance the initial hazard reduction work over an extended term if a maintenance contract is let for the property. If the jobs look too small for the LTO to consider, the residents would have reason to organize in order to bring in economies of scale.

The timber operators want the work, but more importantly, they want steady work. It helps them size their operations and equipment to available jobs. It maintains a steady work force, which improves teamwork and allows for continuous training and higher levels of skill that reduces mistakes. Similarly, the local mills want logs, but they want to manage the forest on the stump even more, much the way large concerns do. This reduces log inventory costs. It allows a rapid response to price changes.

Foresters would also appreciate continuous management of larger acreage without the need to concern themselves with maximizing production. Managing of forests for aesthetic value might be regarded as a privilege. To return lands restore fire cycles, to get rid of exotic pests, to do scientific work and to see the lands they love maintained as productive forest in perpetuity, would befit their personal career goals.

There are arguments that determining risk associated with fuels is a matter of subjective judgement. This will remain true until sufficient experiments are conducted and measurement methods optimized. There is a huge financial incentive to reduce additional risk associated ignorance. There is an array of technical opportunities for this kind of knowledge development work that a rural association of forest landowners could complete and sell.

There is a risk that homeowners with high fuel levels inflict, not only upon themselves, but also upon the entire area. Those who do not pay for risk reduction should bear an increasing fraction of the remaining collective risk as others complete the work. There needs to remain a group motive to assist, educate, motivate, or drive out, the uncooperative individual as a socializing force for neighborhood cooperation. If but one remaining person wants to bear nearly the total financial cost of additional risk to both themselves and the entire neighborhood and also bear the social pressure on the part of their neighbors for the privilege of a half-dead Monterey Pine tree leaning over their shake roof let them pay for it. It's a free country, or it ought to be. The practice of threatening policy cancellation does not work. Price risk instead.

There are also neighborhood capital assets that figure into total risk. Roads should provide a functional means of evacuation to a safe site. Participation in neighborhood evacuation planning should be part of the contract. Once a total neighborhood has achieved a hazard reduction attainment, a second group discount could be derived.

Perhaps such a realignment of interests would form a more functional political majority. It would be comprised of residents who understood the risk of a fire or trees falling on their houses and preferred a more natural look to the forest, forest landowners who want to thin their forests and make a buck, State fire and regulatory officials tired of failure, insurers tired of losing money, and local banks afraid of ruin, as well as a group of more progressive environmentalists.

This plan reverses the current trend of asking fewer acres to produce more wood. The harvests would be smaller in percentage but from more acreage than

before. There would probably be a larger total harvest. The plan raises total revenue for foresters, loggers, and mills and raises tax revenue. Most important: It would be a way to help preserve timberland as a healthier forest, finding its highest value without political distortion. It beats being trapped and burned to death by a random
5 conflagration every time.

Management of Pests and Environmental Toxins.

The most serious form of pollution today is biological, the only pollution that replicates itself. Exotic plants, insects, and fungi convert ecosystem function to a greater degree than any other type of passive habitat degradation. Infestations are
10 often impossible to reverse and, in some cases, a destructive thing to attempt. One thing is certain: We should be just as concerned about introductions of exotic species as we are about genetically modified plants. Federal and State governments do relatively little about it.

The goal of this design is to optimize the balance between maximum control
15 of exotic pest species and minimum dosage of toxic chemicals. This discussion will be broken down as follows: vector transmission, pest identification, treatment, and process development, with the following goal: Maximum target reduction with minimum total risk. Each demonstrates how free markets can do a superior job of lowering overall risk.

20 **Vector Transmission.** Preventing pest transmission is usually the easiest way to prevent the need for pesticide application in the first place. Federal and State governments do relatively little about pest transmission in the name of supporting "free trade." This discussion uses the infectious disease model to illustrate control mechanics for exotic species, as well as demonstrate the mechanics of risk pricing.

25 Suppose that there is an airline transporting people from the tropics where there are known epidemics of tuberculosis (TB) and Ebola. If the patrons of the flight into the U.S. come down with ebola, it is obvious that the airline flight was the carrier transport mechanism. Why? Ebola is rare in the U.S., has distinct symptoms, is easily transmissible, infects its host very rapidly, and is often fatal. The passenger manifests
30 would be checked immediately and all flight patrons would be notified and monitored. People would complain that persons so infected should be allowed onto the plane. If the problem is TB, the symptoms start out like a cold and become chronic

before most people go to the doctor. The diagnosis takes time and the disease is treatable. There is already TB in the US, and the airline could legitimately deny that it was the carrier transport mechanism. It would thus be harder to get anybody to do anything about TB carriers on airplanes than carriers of ebola.

5 If airlines were liable for transporting infectious diseases and exposing their customers, they would likely test for the disease, require proof of non-infectious status at the gate, or charge a lot and then figure out how to make it cheaper. This would provide incentive to develop and distribute effective screening processes that are quick and cheap. We find this obvious because we understand the cost of epidemics and the control
10 methods associated with infectious diseases.

 Similarly, it is usually difficult to prove who was the vehicle for transporting an exotic plant or bug because infestations start small and take time to develop until they are recognizable. A colony of Africanized bees is easier to treat than a fruit fly, for example, because the bees' behavior renders them immediately visible. Most often,
15 however, the vector is a seed or larva. Once they hatch, mature, propagate, and become enough of a problem to be diagnosed, the perpetrator may be long gone and the infestation widespread.

 The problems with affixing responsibility for vector transport are several: duration of the incubation period, difficulty of diagnosis of threat, scope of the impact,
20 relative cost of the infection, scope of the control boundary, and degree of prior infestation of the destination host. The two optional systems for transmission control are civic or civil.

 Civic: Stop every vehicle and vessel at or before the border. Inspect and decontaminate every truck, package, ship container, airline passenger, and boat bilge.
25 Culture all larvae until detected. Hold them up until they are clean. OR tolerate an infestation and treat it all over the country. Either one is expensive. It is the size of the trade subsidy as it exists. It might be cheaper to manufacture domestically.

 Civil: Certify, audit, and insure those importers who develop validated systems to prevent the transport and introduction of exotic pests.

30 Theoretically, no one would want to be an insured and certified transporter unless there is a net benefit: either a cost reduction for adopting the system, or a cost for not doing it. One might assume, therefore, that without the threat of civic regulation of transporting exotic species, it would be difficult for a market to reduce the cost through competition. That isn't necessarily so. Containment, inspection, and prevention work can

be done by private industry. The research and startup costs can be funded out of the financial need to reduce risk. It is the kind of business opportunity that this invention makes possible.

Landowners marketing the value of their ecosystem resources would hold accountable those identified as vector transporters for the damage and the cost of control. What else would you do if you were marketing "weed-free hay" at a higher price and the government road mower brought in star thistle? It is likely that civil liability for negligently harboring, incubating, and transporting exotic pests would outweigh the cost of prevention. Without measuring that cost, there would be little opportunity to make such a claim.

Who is going to do that? It just might be a productive use for all those graduates of ecological study programs. Perhaps they would rather start a business performing these services, rather than languish in servitude as bureaucrats. Society has long recognized that nature needs more experts. It is time we invested in a mechanism to help it happen while retaining our freedom and making a profit.

Once there is real focus on the mechanics of pest transport, through the application of the cost of the insurance to cover remediation, research to reduce those costs will happen. It could be a pressure washing process for trucks and construction equipment with pre-emergent to kill seeds. It could be the deployment of detection dogs. It could be machines to decontaminate luggage. It could be antibody detection strips at airports, the purchase of which would obtain a substantial ticket discount. It could be floating fresh-water "dry-docks" off the coast to kill larval shellfish and parasites. It could be broadband communications instead of travel. These techniques will develop, once we discover the cost of dealing with the alternative. What we cannot continue to do is keep transporting the DNA of every region on the face of the earth and not expect to find habitats destructively altered.

Regardless of whether or not a civil pest control system develops, efforts to prevent transport of exotic species over borders should be greatly expanded. This is one of the great failings of the current fad of trade barrier reduction and a legitimate complaint by environmentalists about the World Trade Organization (WTO). The current policy discounts externalities associated with introduction of foreign pests (including human diseases when the import is labor). It operates as a net subsidy to corporate transportation systems.

Without national sovereignty and enforceable borders, such control systems

will ultimately fail, because of corrupting influences. We must stop subsidizing “free trade” with the outrageous cost of managing the damage it does or, worse, failing to do so.

Pest Identification and Treatment. One person’s pest is another’s native
5 species. This is where global data networks of intellectual property among landowners
can have effect. Not only could an exotic species be identified rapidly, but its
behavior within a niche would be available, including interactions with local
biocontrols. DNA information might help localize the source of infestation, and
thereby begin the trace to identify the carrier because exotics are usually
10 monocultured. Local information is necessary to developing a control strategy, as well
to identify the transmission mechanism by which to halt continued reintroduction.

The power of accountability is how private environmental management can
work with astonishing speed if we invest capital preventing pest introduction, pre-
identifying pest sources, and developing both prophylactic and preventative control
15 techniques. It beats bureaucratic delay and ineffective flailing, while watching a
habitat get buried in weeds due to “insufficient funding.” Web-based library
subscription services can help identify new exotic pests. Infestations could then be
mapped by species. Click its tag name and a spot on a map as a way to report a new
infestation. Link to treatment documents for infestation history information. This
20 would be very inexpensive (the advertising to let people know it existed would
probably cost more). Without telling people that it is there, what it can do for them,
and how to use it, these things will remain arcane. People who have reason to invest
in ecological property value would pay for the information systems and would have
reason to develop control techniques. The result would be to lower the use of costly
25 pesticides and species endangered by loss of habitat. We never seem to notice that
pest introduction brings also the risk of the outrageous expense of going to court,
listing the species, and fighting it out with activists and government and the lost
production that surely follows. Would the cost of a subscription be worth preventing
such an event?

30 On a more local scale, once an exotic is identified and the site of infestation
posted, a control boundary can be established for either quarantine or the limits of
applicable treatment. Here again, a cooperative ethic borne out of pooled risk among
property owners, not wishing to be infested with a pest, could finance the venue for

communication and management of the control boundary through civil liability. The key to such control might be privatized transmission media, including roads.

These arguments again expose the flaws of relying upon civic boundaries for the control of exotic species. The virulence of the pest and the risk associated with infestation will vary by local conditions. If somebody in the road business were responsible for the transmission of exotic species, you can bet that more effective and efficient control measures might develop. They might find a good investment in concentrating transportation across habitats, inhospitable to pest species. It might shock some ecologists that privatization of roads might benefit habitat. Including the cost of externalities in transportation would offset the cost of lower labor costs elsewhere. Why should we trade the cost of treatment or loss of ecosystem health for cheaper products or for subsidized trade?

The key to making the system work, is the knowledge of the cost of risk the property owner possesses, acquired as a result of accounting treatment operations. Without that data, and a civil system to capitalize upon it, there is no ecosystem management; the alternatives are tyranny, wasted effort, loss of habitat, and smuggling.

Often, it is best to develop processes for pest control from where pests originate. The point of origination is where the environmental impact of developing and testing of control mechanics might be most easily and cost-effectively minimized. There would certainly be no risk of escape and it would be a good business for farmers in foreign countries. Landowners could have businesses supporting pest control process development, not just from the standpoint of eradication, but from the perspective of preventing a local pest from escaping a local control boundary. Should such effective control measures be developed, it might bring the economic boon of increased exports. This can occur if, and only if, there is a financial risk associated with such an escape. That risk only exists if domestic landowners have financial recourse for infestations.

Biocontrols may be no better than chemicals. When biocontrol species choose a source of food other than the intended host, it can be a disaster. With Insured Certification the same principles apply to biocontrols as chemicals. That means the risks with both will be compared objectively and honestly by developers, investors, and practitioners. Research on "host-specific pest" biocontrol methods should be consigned to private funding with appropriate financial liability for mistakes.

We should have all the weapons available toward the control of pest species with the goal that overall impact is minimized. There is no substitute for the application of reasoned judgement at all levels of industry, given the variety of threats and conditions. This proposal merely argues that the producer be managed by civil
5 procedure and operational contracts, rather than by arbitrary rules from regulatory agencies. Accountable judgement might be more trustworthy. This might return some pesticide production to the US, where it can at least be watched.

When considering chemical treatment, one must consider the damage that regulation has done to both the industry and the environment. The cost of testing and
10 documentation, necessary to prove that a pesticide is non-toxic, is so high that few large chemical corporations make major efforts to develop them. They reformulate and recertify what they have, the pests develop resistance, and they sell MORE of the same materials with lower research costs and without need for new production facilities. Why not just subject the price to a calculated measure of risk?

15 Pesticide "bans" might be junked in favor of market regulation when the risk of chemical damage to habitat is weighed against that of an escaped pest. If we qualify new pesticides, even if they are more toxic, the freedom to use a variety of these compounds in sequence would greatly delay (or could possibly reverse) the development of chemical tolerance in target species. Overall dosage levels would
20 remain effective at lower levels and reduce toxins in the environment. Under this proposal, Chlordane might be available to eradicate an early invasion of a Formosan termite. The material would be expensive, but it beats letting the bugs get loose and then using thousands of gallons of a less effective material over a wider area. Toxicity to the environment is a matter of dosage just as it is with people. Let the contractor
25 make that decision based upon expert knowledge of risk and efficacy and something to lose if they are wrong. Few people are profligate with pesticides that cost \$500/gallon (they exist).

Any pest control practitioners will make mistakes but under this program there is less motive to cut corners. The scope of damage due to an individual is smaller than
30 a poor decision by a government agency. Since when has the government been responsible for its introduced species? Civic regulation is capable of huge mistakes, like kudzu, a vine introduced to reduce soil erosion that has infested 27 million acres of the Southeast or when Governor Jerry Brown failed to order early treatment of a Mediterranean Fruit Fly infestation in California and ended up using vast amounts of

the pesticide, Malathion in an urban area.

To make certain that more operators are aware of best practice, government should eliminate gag rules on disseminating pesticide formulation and application techniques that are circumscribed by label constraints by anyone who can pass an appropriate examination. The pesticide manufacturer could put the course and the test on the Internet as part of their certified process of verification of buyer competence. Wider dissemination of improved application techniques could broaden the research base on the best applications and uses of the product. It could also serve as a means to identify people operating upon misconceptions before a mistake is made. That would improve both labels and training.

Dose Management. Civic pesticide management systems use "level of detection" as a way of defining safe groundwater, food, etc. The problem is that detection keeps getting better. A measurable value of zero is logically impossible because there is always error and tolerance. "Detectable level" as a safety criteria has become pork barrel for detection equipment suppliers, remediation contractors, and those looking for new victims to sue.

Humans consume 5,000 to 10,000 times more naturally occurring carcinogens in food, by weight, than of pesticides. Many naturally occurring carcinogens are far more toxic than the artificial chemicals. These chemicals increase in concentration as food rests unconsumed after harvesting. Pesticides could actually reduce the presence of the total amount of carcinogen in food because they reduce the pest attack that can increase production of natural toxins. Maximum Tolerated Dose (MTD) testing of chemicals in toxicity studies is nearly worthless from a risk management perspective. Instead, we should develop low-dose response models to estimate chemical safety.

The technical names for this principle relate to the "no observable effect level" (NOEL) or the Zero Effect Level (ZEL) of a toxin. Abatement or mitigation of residues at a statistically significant level below a ZEL should not be performed. Research to establish ZEL on proven toxins should be conducted more aggressively than the studies of the limits of toxicity (the LD50) so that capital can be focused upon truly serious environmental problems. Freshness and natural toxins should be considered when assessing food safety. Fruits and vegetables might be date-coded for time of harvest and delivery history. Ideally, pesticides should be evaluated in terms of total toxic load in goods for sale when combined with natural toxins generated by

food when attacked. Ideally, the toxicity of pesticide residues should be evaluated in combination with those naturally produced, for minimum total toxic load, along with the externalities of effects upon the surroundings as evaluated under Insured Certification. This is a very lofty goal toward metering a correct application by
5 Minimum Total Toxic Load (MTTL) Under this program, they would have a motive to minimize total toxicity and price the risk of an accident.

No government, including ours, could successfully police the sheer volume of produce entering the U.S. for compliance to such a system. Meanwhile, the private sector produces and markets the food, therefore a redundant system within a supply
10 chain has a better chance of verifying contracts and remedies. They would hold each other accountable for passing on, or accepting the residues regarding risk to the worker or the consumer.

Toxicity of pesticide residues should be evaluated in combination with those naturally produced, for minimum total toxic load, along with the externalities of
15 effects upon the surroundings. That is what is meant by minimizing total risk. Rather than trying to ban chemical toxins in food, Insured Certification pest control practitioners would have a motive to research minimum total toxicity methods and price the risk of an error. A redundant civil management system within a supply chain has a better chance of operating with effective internal checks and balances with
20 contracts and remedies than does the policing function of government. Each supplier within the chain would hold each other liable for passing on, or accepting the residues, in measure of the risk to the worker or the consumer. If the pesticide degrades it might be safe to handle a load inside a container at the dock, although at the time, it might be relatively unsafe to eat. Post treatments, including rinsing and
25 neutralization processes or distribution time might take care of the chemical residue by chemical decay processes. The benefits are lower cost, fresher food to the consumer, jobs for the foreign workers. On the other hand, if the chemical resistance inherent to certain vegetables develops rapidly, the value of a farm in close proximity to the consumer would rise.

30 **Management of Rare and Endangered Species.**

The Endangered Species Act (ESA) has done more to destroy the value of private resource land than any other environmental legislation. It started out

protecting animals that were being hunted to the verge of extinction. Whether it was passenger pigeons, raptors, or prairie dogs, the main reason for their decline was that people were trying to kill them. Often government was the prime offender, offering a bounty for killing the species as pests.

5 Early biological surveys suggested that one of the factors contributing to the decline of some species was destruction of habitat. It was argued that, to save the species, their habitat must be preserved as well. Preservation was the usual prescription, whether that included preserving conditions that had contributed to the decline in population, or not.

10 Consider such a forest landowner that has, for generations, cared for a forest by the best standards of the day, learning to do a better harvest each time one was conducted, and complying with the law, as necessary. The land near the property is being developed rapidly, and because that family has done such a good job caring for it and preserving open space, the government wants to take it to protect some fish or
15 other species, that may be doing fine.

Should the owner resist, the listing of an endangered species can leave the property valueless. It can destroy the ability to raise the capital or provide the cash flow out of operations to improve the habitat for the species of concern. If the project doesn't work, the owner may be held responsible for the results. The "standards" are
20 subject to rapid change. If the improvements aren't performed in a manner preferred by the enforcing agent, the owner can face an expensive defense against outrageous fines, even if the specified actions are demonstrably counterproductive. These fines can be assessed without due process, even if the owner is not culpable for the historic decline. Sometimes, the use of the land is taken simply because it might be a place
25 deemed suitable for reintroduction. From the perspective of the landowner, endangered species have literally been transformed into dangerous species.

What landowner would take "the long view" of habitat management, when faced with an escalating risk that the land taken forever by exercise of political or judicial whim? If a landowner discovers an endangered plant on the property, the
30 rational response to this policy would be to identify and destroy the species before the authorities found it. If the authorities do find it and "preserve" the habitat, they can end up mandating retention of the very processes that are inducing the degradation.

Environmental activists have demanded that government take control of riparian corridors to protect fish even if there is no evidence of stream degradation.

The public representatives of those who bought the houses and wanted the freeways, declare the forest so "valuable" that it must be taken from its owner while they are unwilling to compensate the landowner for that value. Meanwhile, the State still issues fishing licenses for salmon when the ocean survival rate has been established as the cause of decline! Together, they guarantee that a firestorm will destroy houses, forest, and fishery. It is a democratized commons, created because there is a majority constituency that got theirs, wants new products from the land, and doesn't want to pay for them.

The suburban areas are already developed. The owners of all those other parcels derived ALL the benefit of the conversion at no cost to protect the displaced species. The purchasers of those houses paid NOTHING for protecting endangered species. The owner of that last remaining parcel must bear nearly the entire cost to protect that species and is disallowed any reward for their investment, in order to please those same homeowners. We punish the landowner for patience, or even the desire, to operate a resource business adjacent to an urban area even when the land use isn't the cause of a loss of habitat. Such owners are, in effect punished for NOT having already destroyed that habitat. When they go broke or try to sell, we accuse them of profiteering and demand "purchase" of their land at a suppressed price under eminent domain for greenbelts to halt urban sprawl!

The urban public is insane with insatiable greed. Shouldn't we be thanking these people for finding a way to hold the land intact for all this time? Given that they have been so patient and foresighted, should we not be rewarding that? This idiotic process of punishing those we should celebrate is happening all across the country. The number of cases is so numerous, it really isn't worth an endless list of horror stories about spotted owls, fairy shrimp, furbish lousewort, snail darters, kangaroo rats, bull trout, and the like, to prove the point. We already know about government stewardship, so what is the choice really about?

What might we do, to get people to look for rare and endangered species and foster their development and renewal, while maintaining a dynamic balance among competitors?

This proposal is about what might be done to have landowners protecting them as if endangered species were buried treasure. We could take a lesson from what nearly destroyed many endangered species. In the past, if the public wanted to get rid of a "pest," government offered a bounty. It was effective. Bounties are why so many

of these animals were nearly destroyed. Could we just do the opposite? Pay people to increase their numbers inverse to the difference between current and sustainable levels? Do they want jealous protection of the endangered species? Do they want good census data? Do they want it done under the guiding hand of a specialist? Then
5 they can pay for it without having to buy the property or lose all its productivity.

It would cost less to pay to increase the numbers than pay for all the lawsuits and lost production. How would we qualify the price? How expensive is the land? How valuable is the alternative use? What is the cost of the work to be done? What is the risk of species loss? It would be great if we knew. Through the Insured
10 Certification process, we would slowly find out through that same accounting of mitigating activities and research. It would be no surprise if government ended up paying landowners less for helping endangered species than the price of the lawsuits to property owners, not to mention an enforcement bureaucracy that does little for fish. Such payment need only be enough to motivate the desired result and would
15 yield income taxes in return. It is also likely that a market in risk offsets will replace civic incentives. If it is a good investment, there will be a source of capital to support it. Imagine a commodities market in endangered species credits. Such credits could eventually function in a privately-funded market as risk offsets among Insured Certification enterprises. It would be mitigation, with hard, quantified economic
20 value.

Landowners can and will invent better means to improve habitat but only if they can afford it. At least they won't all try the same thing. It would also make the bureaucrats more circumspect about declaring a "subspecies" endangered in the first place. A lot of these declarations of subspecies status are simply for the purpose of
25 confiscating land for variations that are not subspecies at all. Sometimes the motives involve corruption. The real reason activists would complain is that they would lose what they regard their key "weapon" in "their" fight to save the environment. Why the fight? Do they have to do the saving? Whose environment is it, anyway? Did they buy it? Is this about career, ego, or results? Since when did "weapons" save anything?
30 Isn't there such a thing as collateral damage?

The Insured Certification is perfectly suited to this problem. The certification company provides independent verification of best practice land management and accurate data. The insurers finance reduction of the risk and perhaps manage the payments for accurate reflection of the latest census data. Because it is a competitive

market based upon objective data, it would be less corrupt than what is happening now.

The EPA policy goes so far as to demand confiscation of the use of land to preserve habitat for species of both non-native and of undetermined origin, as if their presence was somehow critically necessary, when the situation may be the converse. It is becoming increasingly common for amateur biologists, such as lepidopterists (butterfly collectors), to keep populations of unique insects secret from the EPA in order to protect the species from civic preservation. Often the reason the butterflies are in decline is that the supporting native vegetation is being displaced by weeds or simple succession. Preservation under such circumstances would be disastrous. Sometimes the best thing one can do to restore a native plant population is to turn over a vacant lot with a bulldozer!

Under Insured Certification, and with the power of creativity that it unleashes, we might even end up with a futures market in risks to endangered species. There might be speculative value to be found in the knowledge derived of ecosystem interactions, cyclic weather phenomena, and new mitigation technology. The net result would be that capital would flow to the most valuable resources under the greatest objective threat or opportunity toward improving ecosystem function. The investment would be more cost-effectively focused toward reducing the scope of the problem and its associated risks.

Management of Non-Point Nitrate Pollution.

The Civic Problem. Nitrate is a family of chemical compounds critical to supporting plant life. Dissolved nitrate is a foundation for of riparian nutrition. It feeds algae and plants that feed insects that feed fish and eventually returns into the water as the product of animal feces and decomposed vegetation. The solids from these products form a layer on the bottom of the stream, called detritus. Detritus is loaded with nitrates. The primary concern over nitrates (or phosphates) is a biochemical process called eutrophication: the result of adding of large amounts of nutrients (over 100ppm nitrate) and organic matter into a slow moving water body. Should the resulting algae bloom be excessive, its decomposition consumes so much dissolved oxygen that aquatic species can suffocate.

The State of California and the County of Santa Cruz quickly realized that a

democratized commons of "clean water" was a way to power. They consequently produced a nitrate attainment standard with which nature alone could not comply. The State Department of Toxic Substances Control designed successive septic systems standards, each of which was to meet all foreseeable circumstances in order to reduce concerns about nitrate pollution. A large number of those new, upgraded, and State-engineered septic systems failed after but a few years. Was the product guaranteed if it was installed and operated as directed?

The "help" they got from the County was that new staff of inspectors. These people, with only cursory training, force their way onto private property to find and inspect the septic system and determine if it is "compliant." If there is a gate, if they see a large and unfriendly dog running loose, or if they are in a hurry, they have been known to do that \$200 inspection from the top of the driveway. They are known to have looked for other things that might not be compliant, such as a rental cottage or an unpermitted addition requiring a visit from the County assessor. California has a "Right to Privacy" written into its Constitution.

The courts have interpreted disclosure and liability laws to protect consumers from hidden problems when a property is sold. Every potential problem has to be disclosed. If you don't know about a problem, you have to hire expensive experts until you do. What started out as a termite report has escalated to escrow documents over an inch and a half thick. If, upon inspection, there is a problem with a residential septic system, the County puts a notification on the Record of Title of a system failure, even if it has been fixed. If it is on the title, it stays there. If a notification of non-compliance goes onto the title, the mortgage holders catch cold. There are cases where this process has devalued a \$300,000 home by two thirds, virtually overnight. Try to borrow money to fix that kind of problem. There are active cases, which have extended over 7 years without resolution, with tens of thousands of dollars spent on legal bills and engineering studies. The house is non-compliant. The County wants no part of the liability for non-disclosure and neither does the State. It's on the deed.

Most logical homeowners would pump out the box every seven to ten years, before the system backs up. Once the tank is empty, it is a good time to look at it and fix any problems before they get serious. Not any more! If the pump truck shows up and the operator suspects that there is a problem, out comes the pad of notices to the County. People so fear the County septic inspectors that they would rather let raw sewage flow out onto the ground than call the pump truck. Fear has an adverse

environmental impact.

The County didn't want responsibility for any of it, lest they be sued. They also want hefty fees for any required upgrades. Since the homeowner can't sue the State or County for the law, their only recourse is to try to sue the septic contractors and consultants. Thus, the only people with sufficient knowledge of local conditions to solve the problem are stuck using a system whose design is out of their control. Each time a decision has to be made a licensed professional must make it to the latest Septic System Specification. Slopes and boundaries must be determined by a civil engineer or land surveyor, soil type requires a geologist, diffusion rates and system design need a Registered Environmental Health Specialist. After spending all that money, review of the proposals go to a single, County Environmental Health Supervisor who has never built such a system in her life. Plan review alone, costs \$2,000 in fees, each time around.

If they don't approve one can apply for a "Non-Standard System." That goes on the title too. They work, but they do cost more to install and operate and are not intrinsically safe. The average cost of these new systems is exceeding \$30,000 including paperwork. The contractors ended up bidding jobs with no idea how the law would be interpreted by County officials with no experience in septic system construction, and producing decisions that could get them sued. The contractors went on strike. Repairs to existing systems halted. The real estate people were furious. The tax collector didn't like it, either. When a house is reassessed upon a transfer, the tax revenue on the property can quadruple. The septic systems backed up.

The issue never was really about water pollution. Nitrates in the amounts found in the watershed are probably beneficial to riparian health. Even in the drought years of 1977-78, according to the State, there was (and is) no eutrophication in the San Lorenzo River. The only problem related to nitrate that has persisted and may require action, is the taste of the water for urban consumers. In 1995, the City of Santa Cruz paid \$66,000 for odor treatment, less than \$0.50 per person, per year. The rural inspections, alone, cost each rural resident \$186 per year. The low-nitrate rural septic system upgrade is over \$2,000 PER YEAR. The mean cost for the various suggested means of removing rural nitrogen is over \$2,000 PER POUND, PER YEAR. That is what a socialized commons can do.

Control of non-point pollution is very effective at controlling who gets to build and who gets to stay. Where would people live? They would have to move into the

city where they would use more urban water from the San Lorenzo, instead of distributed groundwater sources elsewhere. Accordingly, the city hemmed itself in from the outside with greenbelts so that the only way for the city to go is up. What does that do to the price of housing, inside the greenbelt? The housing affordability index for Santa Cruz is the worst in the nation.

The Free-Market Solution. A civil servant's idea of "fair" is a uniform solution, often called a conformance specification. Unfortunately, nature doesn't know what either "fair" or "uniform" is, whether concerning nitrate or anything else. Non-uniform solutions might be more "fair" because each asset costs what is appropriate to each circumstance. A market can do that, where governmental agencies simply can't.

Septic systems are in many ways the ultimate rural sewage treatment method. They recharge the water as close to its source as possible, which is a minimum disturbance to the natural hydrologic cycle. They do not require major arterial pipes that are a hazard in an earthquake or landslide. There is usually no requirement for electrical power or other utilities. It is astounding that the State of California and County of Santa Cruz, could turn administration of septic systems into something so terribly complex.

A management system, designed around Insured Certification solves the problem, permanently. If the contractor guarantees that the system will perform when operated within design limits, that is better than what government does now. Once the guarantee includes operation and maintenance of the septic system, the miracle of the marketplace starts to blossom. Septic contractors could put together a utility business to manage the systems and guarantee operation according to unique customer circumstances. The first thing that will probably happen when they take over operation is that they will find that they will have a hard time monitoring operation. If a toilet has a bad valve and starts to run 24 hours a day, it can kill a marginal system in the winter. There is a fix: timed flow switches and solenoid valves on toilets. If a house system cannot be monitored for flow easily, because gray water or irrigation systems are mixed with sewerage and domestic supplies, divorced piping systems may be necessary. Such things improve and get cheaper under competitive pressure and would eventually evolve into water management systems for the entire home.

A water management system could maintain a marginal septic system on an old

house safely until removing both was economically justified. There would be no associated waste of capital or needless environmental impact. Such systems would motivate installing the control points for a functional water market. Can the County do that? Does it sound worthy of investment?

5 There is even more profit opportunity in converting systems that have a high potential for future failure before the event; something the County system does not address. The pooled risk approach might work well here too. There is no need to wait until the effluent is running out onto the ground to address a problem. If the systems are 95%+ deficient, as the County has suggested, then that fact may serve to motivate more
10 collective action on a neighborhood basis. Isn't 95% a lot though? Does that mean that they are deficient or does it mean that they have designed a spec that can't be met by those earlier systems that they permitted? Would the County bureaucrats have incentive to redefine the specification, so that everybody has to come to them for an expensive upgrade with outrageous fees? Are there any side effects?

15 The County asserts that 5% of the existing systems cannot be upgraded to meet specifications. It is an easy fix. Let's assume that the certified contractors do the best they can. What if, after all attempts, the systems can't be fixed economically? This is where insurance steps in. If it doesn't work, an insurance fund can pay to relocate the homeowner and mitigate the site. The insurance premiums might cost an additional 10%
20 of the base cost of each system, but this is wildly less than is being assessed by the County for all the plan checking and oversight being done now. It beats the cost to the community of a personal financial disaster and a public health hazard.

 A septic "drain field right" is an example of an unrecognized asset. A lower site on a hill with a field of alluvium unsuitable for building could generate open space
25 revenue as a deposition site for houses on a steeper ridge. This would less likely destabilize slopes, the liquid could reduce the need for irrigation, and the asset value of "view sites," unsuitable for septic systems, could be improved with lower impact and a nice view of an open field. The use of easements can allow neighbors to take advantage of minor economies of scale, for example with neighborhood black water systems and
30 gray water leaching. This could reduce the frequency of many undesirable compromises made when the boundaries governing system design is a set of property lines.

 People have sold water rights, access easements, and redrawn boundaries for years, so that is nothing new. In the past it has been an expensive process. There is minimal education of participants to keep reins on the gatekeepers. Government has

increased the cost in the name of making development more difficult. Transaction volume is so constrained that specific expertise in these matters has not developed into a common professional trade. Perhaps those real estate agents might want to learn?

5 A private system will be, in all likelihood, cheaper to operate. It will end the
idiotic practice of constructing overkill solutions, placed where they are not needed, or
are inadvisable. This will end the legal hassles when the real estate agents come under
fire for houses that are sold in summer, only to have their systems fail the next winter
because those properties that need it would be under continuous management. This will
end the waste of capital when a person buys a piece of otherwise excellent property, only
10 to find out that the property is inappropriate to the latest change in the County spec. It
will allow in-fill development, instead of forcing continued sprawl, and allow
construction of simpler systems to meet unique circumstances.

When people are free to demand guarantees, manufacturers will improve the
design, installation, and operation of their products. Consider, for example, a fireproof
15 black-water hose that eliminates the need for trenching steep slopes and absorbs
earthquakes without rupture. The technology won't be invented and these products will
never get cheaper unless the public is free to buy them. This is something
environmentalists understand, but seem to be determined only to mandate by law.

The people in that septic State R&D department do have expertise that could be
20 useful to system manufacturers and suppliers. Most of the technology is there: multi-
channel control systems, thermal flow switches, and solenoid poppet valves. It is more
humane to devise a water management system than to condemn the house, turn families
out onto the street, and pay lawyers to come up with a settlement. It also beats cholera,
typhoid, or dengue fever spread by people too afraid to call the pump truck.

25 Finally, if it costs but a dollar per house to improve the taste of urban water,
isn't that cheaper than \$2,000 per year for an illegal search, unnecessary upgrade
capital, and outrageous operating costs? Meanwhile, in some cases, the added nitrate
would possibly BENEFIT riparian function on seasonal basis. Local corporations
managing nutrient in these watersheds can integrate competing interests among
30 fisheries, domestic water, urban land use, erosion, silt, and flood control, all using
risk-based pricing.

CLAIMS

1. A free-market environmental management system, comprising:
 - means for developing operational processes specifications for land use to conform to specified outputs;
 - 5 means for validating that said operational processes produce outputs that meet said specifications;
 - means for auditing and certifying that said operational processes produce outputs that meet said specifications;
 - means for assessing financial cost of mitigating said operational processes to restore or protect corresponding ecosystem assets;
 - 10 means for assigning said financial cost to remaining ecosystem assets at risk;
 - means for indemnifying failure to produce outputs that meet said specifications and to repair or to mitigate said failure; and
 - 15 means for indemnifying failure to allocate sufficient primary coverage and to repair or to mitigate said failure.
2. A method for managing ecosystem assets, comprising the steps of:
 - developing experimental processes;
 - 20 deviating from said processes to meet conformance specifications to improve condition of ecosystem assets;
 - validating that said experimental processes were conducted according to said specifications;
 - auditing and certifying that said experimental processes were conducted according to said specifications;
 - 25 assessing financial cost of said experimental processes to improve the condition of said ecosystem assets;
 - indemnifying failure to produce outputs that meet specifications posited by the experiment and repair or mitigate said failure;
 - 30 indemnifying failure to allocate sufficient primary coverage to repair or to mitigate said failure;
 - developing natural process descriptions from data derived from said experimental mitigating process operations;
 - validating and certifying that said natural processes correspond with

said process specifications;

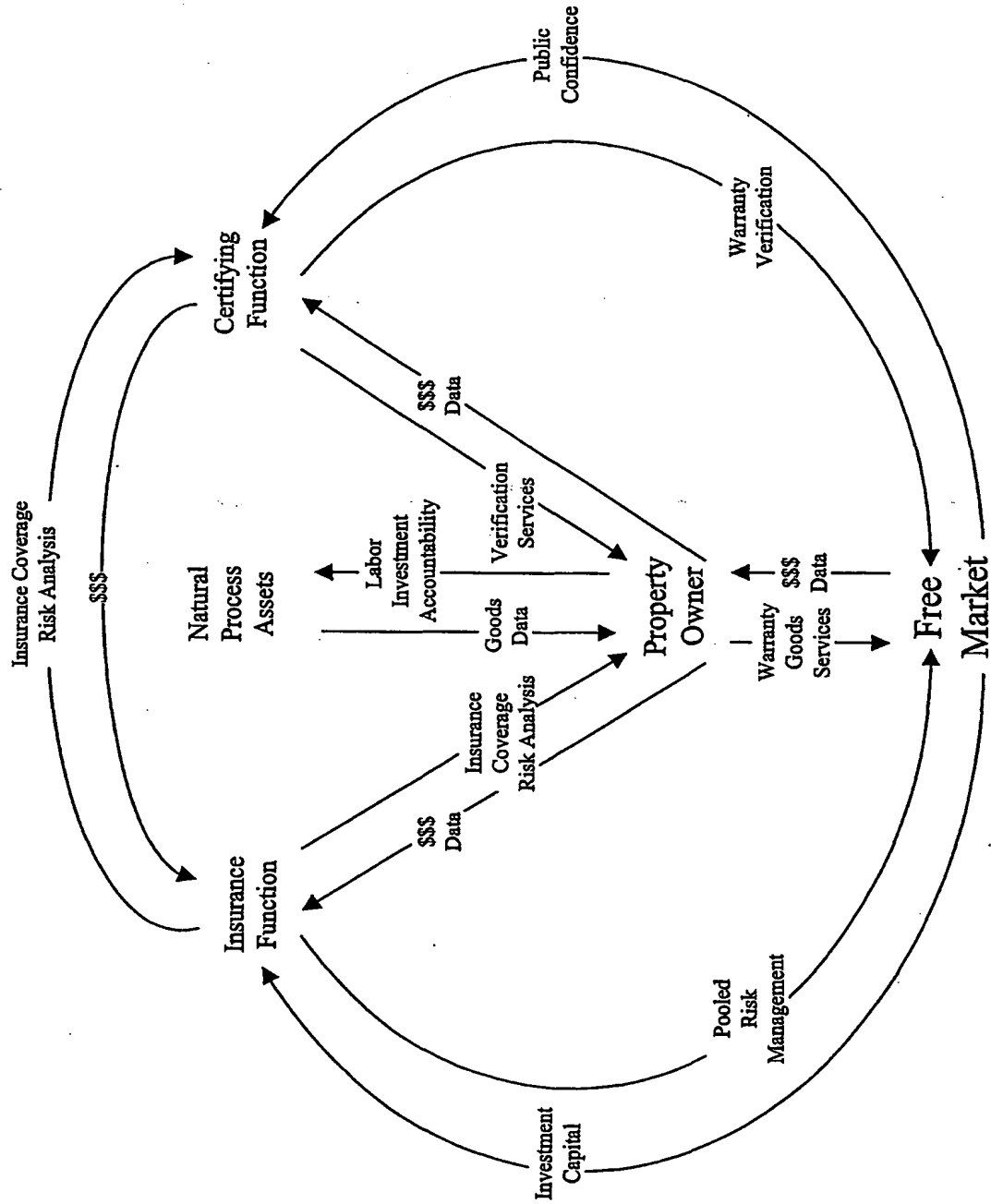
assigning financial value to ecosystem assets for their ability to mitigate operational processes;

5 marketing financial value to mitigate operational processes with ecosystem process assets for their ability to mitigate operational processes;

indemnifying failure to produce outputs that meet said conformance specifications and mitigate said failure; and

indemnifying failure to allocate sufficient primary coverage to mitigate said failure.

10



**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.